POPULAR Computing WEEKLY

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This Week

News Desk

Dragon slips a disc

TWO companies seem likely to produce disc systems for the Dragon 32 microcomputer in March — ahead of the official Dragon Data unit

Premier Microsystems and Compusense both have disc systems ready for launch, the two products designed for markedly different applications

Due out first, the Premier system is considerably cheaper The disc interface containing the disc operating system in Rom, supplied with instruction manual is priced at £99 95 including VAT

The system will run with most 5¼-inch 3 inch or 8-inch disc drives — single density, single or double sided 40- or 80-tracks Up to four drives can be controlled at any time Premier Microsystems will at first be offering a package of the disc interface and operating system plus a single 100K 40-track 5¼ inch Canon drive for less than £300 including VAT A twin disc system will be priced around £500

Continued on page 5

Spectrum sales top 200,000

SINCLAIR Research has sold more than 200,000 Spectrum computers in the nine months since the machine was launched

Resulting from this success the company has announced more retail outlets for the Spectrum — it is now available in selected branches of Boots, Currys, Greens and John Menzies The distribution organisation, Prism Microproducts, will also be supplying John Lewis, House of Fraser and Xerox stores

"By Easter we expect to be selling between 12 000 and 15,000 Spectrums per week in the UK," said Current Products Division Managing Director, Nigel Searle

Current monthly production of the Spectrum exceeds 50,000 units

★ ★ BRITAIN'S HOME COMPUTER WEEKLY ★ ★

ZX SPECTRUM … S ZX81/80 ZX SPECTRUM PRINTERS ZX81/80 ZX SPECTRUM
KEYBOARDS … UPS SOFTWARE KEYBOARDS USER GROUPS SOFTWARE KEYBOARDS
PROGRAM … HARDWARE PROGRAM AIDS BOOKS HARDWARE PROGRAM AIDS
SOUND G… SOUND GENERATORS CONSOLES MONITORS SOUND GENERATORS
BUSINESS… BUSINESS PROGRAMS GAMES MAGAZINES BUSINESS PROGRAMS
MEMO… MEMORY EXTENSIONS JOYSTICKS COMPUTERS MEMORY EXTENSIONS

See us at the ZX Microfair!

If you own a ZX81 or SPECTRUM — or if you're thinking of buying for the first time — **the ZX MICROFAIR is not to be missed!**

There's literally everything for the beginner, amateur, enthusiast and professional.

A fantastic range of products from both the established manufacturers and the newer ones!

There's a bring and buy sale and a complete show guide available on the day.

It's a good day out and the opportunity of learning everything there is to know about ZX Computers.

The facilities at the hall include Bar, Restaurant and lots of seating!

Make a note of it now, or write to Mike Johnston, 71 Park Lane, London N17 0HG for advance tickets (Cheques etc made payable to ZX MICROFAIR and please enclose S.A.E.)

At 80p for adults and 50p for kids (under 14) it must be a bargain!



SAT FEBRUARY 26th • NEW HORTICULTURAL HALL LONDON SW1 • 10am-6pm

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The Team

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Programs should whenever possible be computer printed

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Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish although we will always try our best to make sure programs work

This Week



Editorial

The question of software libraries has been causing increasing concern among software houses, retailers and buyers in recent weeks

Following our latest article on software libraries and copyright (*Popular Computing Weekly* February 3-9), we have received a large number of letters arguing the case both for and against such libraries We have also discovered a software library that has been hiring out cassettes against the wishes of the original publisher

In an attempt to lay down some sort of guidelines, we have decided to accept advertisements only from those software libraries which use cassettes with the permission of the publishers Software libraries which hire out cassettes without permission will not be allowed to advertise in *Popular Computing Weekly*

We are taking this stand because we believe software libraries are an issue that needs to be tackled now Hiring cassettes without the permission of the publishers may or may not be illegal — it is certainly hard to justify

This is not to tar all software libraries with the same brush A number of software libraries do obtain permission from, and negotiate royalties with, the companies whose cassettes they hire out We have no quarrel with such organisations, we just wish all libraries operated on similar lines

Next Thursday

How low can you fly without crashing? Find out in Foxbat, an exciting new game for the ZX Spectrum

Also next week, details of how to win £10 in our Cruising competition

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Dragon discs

Continued from page 1

"The software in the disc operating system will appear to the user as an extension of the Dragon's Basic," explained Premier partner Peter Riban. This will give new commands — *Save Load*, *Save M* and *Load M* (for machine code), *Create* filename and *Asign* old-filename/new-filename. When saving the system will automatically re-create the file if necessary.

The Compusense Dragon disc system is more ambitious and, correspondingly, more expensive. For between £500 and £600, Compusense is offering a twin single-sided double-density 40-track 400K system together with disc interface and operating system. The disc interface incorporates an add tonal 64K Ram and an RS232 interface.

Compusense is also recommending that the system be used in conjunction with a 24 x 80 display intelligent terminal, which will cost in the region of £400. Says director Ted Opyrchal: "To run any useful business programs you need a degree of expandability — 64K — full RS232 protocol and a proper display. Using the Flex operating system in our interface and a 24 × 80 terminal gives access to a whole range of 6809 software packages." Software available under Flex includes *Dynacalc*, *Database Manager*, *Micro Assembler* and the languages Cobol, Pascal and C.

"Our thousand-pound Dragon then begins to look like a system costing three times that amount," he said.

Micro industry group to get protection

A NEW group has been formed which aims to protect the interests of those in the microcomputer trade.

Membership of the body — called the Society of Computer Manufacturers, Agents and Dealers — is open to any company, partnership or sole trader commercially involved in the computer trade.

Acting secretary Nigel Backhurst explained that the group was set up to promote the interests of both hardware and software suppliers, big or small. Members so far include Atari, Bug-Byte, Buffer Micro Shop, Campoters and Tandy. Backhurst is actively campaigning for other companies to join the group.

The society will hold its first meeting on Saturday, March 5, at the 6th Form Centre, King Edward VII College, Warren Hills, Coalville, Leicestershire (3 miles from the M1 A50 junction). The meeting will begin at 11 am.

Among resolutions to be considered is one which urges that the society be "concerned about the activities of software libraries, [and] should take action on behalf of its members against them."

Any individual in the computer trade is welcome to attend this first open General Meeting.

More details from Nigel Backhurst, 108 Margaret Street, Coalville, Leicestershire (tel 0530 33566).

Creative software says 'die'



PAUL ZUZELO flew in from California earlier this month to announce that his company — Creative Software — has signed an exclusive distribution and marketing deal with Audiogenic.

Creative Software, one of the leading US manufacturers of Vic20 cartridge software, is to sell its current Vic20 range and forthcoming Commodore 64 titles through the Reading-based company.

The American software producer employs a new technique in the manufacture of its cartridges. Instead of the game being in the form of a Rom 'chip' the program is held in a 'die' manufactured *onto* the printed circuit board.

"This means," says Zuzelo, "we can put out a 16K die on-board for about the same cost as we can a conventional 8K Rom.

In practice this won't mean that cartridge prices will come down — rather you will see the quality of the game go up."

Among the Vic20 games Creative Software will be marketing through Audiogenic are some of the biggest selling US titles — *Astroblitz*, *Trashman* and *Choplifter*.

6th ZX microfair

THE SIXTH ZX Microfair will be held on Saturday, February 26, at the usual venue — New Horticultural Hall, London SW1. It will be open from 10 am to 6 pm and entry will cost 80p for adults and 50p for kids under 14.

Over 100 exhibitors will be there and new tapes should be on sale for the first time from Quicksilva, Silversoft and Carnell.

Atari sues Philips

ATARI has embarked on another legal battle over copyright in the 'Pac Man' video game — this time with Philips.

The decision to go ahead with the action against the UK arm of the Philips multinational follows a successful similar legal move against Philips in the US.

Atari's other, better known, move against Commodore is due to be heard by the English courts in March.

US competition for Spectrum

THE vicious price war faced by Sinclair in the US takes another turn as Texas Instruments cuts a further £31 off the cost of its TI99/4A computer.

This will bring down its average American price, already rebated by the manufacturer until mid-April, to £98. This figure is close to the proposed price of the American 16K Spectrum of £95.

The TI99/4A sells for £199.95 in Britain.

Trojan sees the light

FOR £10 you can now buy a light-pen for the Dragon 32.

The unit plugs into the joystick port on the computer and is addressed from the keyboard using normal joystick commands.

The light-pen is produced by Trojan Products and comes complete with a cassette which includes full instructions and several demonstration programs showing how to incorporate the input from the device in a program.

"It uses quite a fast phototransistor so it will be possible to use it in machine-code games.

"No specialised software is required and it can be used for X-Y plotting or data entry as well as in games. It can offer a much faster alternative to the keyboard," says Trojan's Geoff Jones.

Details from Trojan Products, 166 Derlwyn, Dunvant, Swansea.

TI's rival to the Spectrum

TEXAS Instruments rival for the ZX81 — the TI99/2 (see *Popular Computing Weekly* Vol 12, No 4).

The machine, which will sell for between £70 and £80, has the advantages of 4K Ram as standard, plug-in Rom cartridge port and the range of inexpensive peripherals shown. The three add-on units shown in the stack are (top to bottom) HX-1000 four-colour printer/plotter, HX-2000 Wafer-tape high-speed micro tape drive unit and HX-3000 RS232 interface. The modules connect to the TI99/2 via a Hexbus interface connector at the rear of the machine.

Micro software association

The proposal made in your letters column (December 30), to form a British Micro Software Authors' Association, is one that every software writer should take very seriously indeed

Apart from matters of copyright, such a body may well be able to offer advice to new writers on how to deal with established software houses, how to prepare programs for publication in magazines (perhaps offering editors some welcome relief in the process), and possibly also reviewing and offering constructive criticism of software In addition, it could advise on the sort of price, packaging and marketing method that might be appropriate to individual programs The experience gained by individuals in these matters could thus be pooled and made available to others whose main interest, after all, is likely to be in *writing* programs rather than the process of *selling* them

I would be most interested to hear from any software writers who may be interested in co-operating to form such an association (an SAE would be greatly appreciated)

Nick Godwin
4 Hurkur Crescent
Eyemouth
Berwickshire
Scotland

Taking issue with a smear

With regard to the software library issue, please do not tar all software libraries with the same brush The *Monster Software Club* is probably one of the latest software libraries to advertise in your magazine No not just another library jumping on the band-wagon, the latest only because I have first gained permission to use the tapes that I list I now list software for the Dragon from six producers — all tapes are used with the producers' permission and with royalties being paid

A "legally" run library offers the following for the members — access to a full library of software at a relatively small cost For the software houses — we supply a ready made market for its software (I am after all purchasing software) plus royalties

One of your correspondents (*Popular Computing Weekly*, February 3-9) suggests that you withhold any advertisements from software lending libraries Perhaps he can tell me why I should be stopped from advertising?

In your view you stated "Each cassette should display a message, in a prominent position on the outside, stating that it is a condition of sale that the cassette will not be hired or lent" I agree with this if the words "without permission" are added But, if this does stop illegal lending, what about the Exchange Clubs and software banks?

A Robinson
Monster Software Club
32 Lennox Drive
Lupset Park
Wakefield
West Yorkshire

Mr Robinson is quite correct in the points he makes in his letter. We have no quarrel with software libraries which obtain permission from, and pay royalties to, the software houses whose tapes they hire out. Unfortunately, not all software houses are as scrupulous as the *Monster Software Club*

Co-ordinating action

While applauding your offer to co-ordinate the formation of the much-needed trade association of software houses, I would suggest that the primary answer to unauthorised hiring of programs lies in the *Sale of Goods Act 1979* This clearly states that any contract of sale may be absolute or conditional

Provided that the software supplier highlights the fact that the sale is "conditional" on his invoice (including in the terms a requirement for further payments such as royalties in the event of hiring out to third parties), then the contract remains open-ended Such a caveat, while not preventing the hiring of software purchased, would at least ensure that royalties would be claimable

I can imagine that some of your readers will feel that all this "aggro" over tape libraries is a "spoil-sport" attitude on the part of the trade To such readers, I would point out that if they want a regular supply of new programs then they should bear in mind the example of the book trade

Peters Woods
The Dragon Dungeon
PO Box 4
Ashbourne
Derbyshire DE6 1AQ

The problem with *The Sale of Goods Act 1979* was highlighted by Gail Counsell in *Popular Computing Weekly*, February 3-9 While the contract of sale may indeed be either absolute or conditional, it does not "bind third parties" Thus the person who buys a tape direct from a software supplier can be bound by the contract, but if he subsequently sells the tape to a third party, that person will not be bound by the contract.

Then where's the fault?

I have been reading your magazine for a couple of months now and recently bought a Spectrum I dug out my old books and tried *Under Pressure* However, it did not work I checked it through, but in the end I pulled the plug on it

Now I have typed in *Missile Command* and checked it through four times, but it just keeps saying *B Integer out of range 95 3* Line 95 though is perfectly correct and so are all the others

I suggest that you try out this program yourself and send me the correct version of it or I will stop buying your magazine I only get it for the programs

David Jackson
7 Theydon Gardens
Rainham
Essex RM13 7TU

I tried both programs before they were printed and I can assure you they do work The listings were taken from cassettes of the programs after they had been tested, so we know they are correct Enough people have also contacted us and said how much they enjoyed playing the games for us to be confident that the programs were printed correctly

We do not claim to be infallible, but we take a great deal of trouble to try and ensure that the programs are printed accurately.

Dragon lovers

The following information may be of use to fellow Dragon lovers The *Peeks* for the arrow keys are, *Left (343), Right (344), Up (341), Down (342)* A value of 223 is returned for pressed and @ 255 not pressed Using *If Peek (341) = 223* etc allows repeat keys for movement within games for those without joysticks and is much faster than the cumbersome *Inkey$* routine

The start and end pointers for Basic are located at *Peeks* 25 to 28 and allow the loading of more than one program from tape *Peek* 25 and 26 gives the start pointer — normal values are 30 and 1 Multiplying the first value by 256 and adding the second gives a decimal location of 7681 (default position with four pages of graphics reserved) *Peek* 27 and 28 gives the location two bytes to the right of the end pointer To load multiple programs from tape use the method in the example although your actual values will depend on the length of the programs

Example
1 Cload program A
2 Print peek (25) peek(26);peek(27), peek(28)
Sample values 30 1 42 136
3. Poke25 42:Poke26 136 rem 136-2
4 Cload program B
5 Renum so that start line is higher than the highest line number in program A
6 Poke 25,30: poke 26 1 rem original values

You should now be able to list both programs Using this procedure repeatedly, I successfully combined six shortish games with a selection routine to enable my son to play any of the games without reloading Care must be taken with variables of course, but a return to the selection routine and a *Clear* statement takes care of this

Acknowledgements are due to E O Gilligand Jnr of Birmingham, AL 35226 USA for this pointer The information was gleaned from his article on the Tandy Color Computer in the US magazine *80MICRO* November 1982

Doug Dixon
15 Hawkins Way
Abingdon
Oxon OX13 6LB

Dragon's Lair

A new game for the Dragon 32 by Ian Mercer

The object of this game is to guide a magic cube through a series of interconnecting passages vaporising the dragons sleeping in their lairs, while attaining as low a score as possible

You use the cursor keys to guide the magic cube (positioned in the top right-hand corner of the screen at the start) through the passages which contain four dragons (inverse "D"s) that rest on the various levels

The floors and ceiling of the passages are lined with rocks which should be avoided Collision with the rocks will add to your score and cause the cube to bounce off in a random fashion Pressing a key will also add to your score

In the harder levels, the path to the next passage is sometimes blocked Pressing "D" in such cases will dig a hole directly below you, but use this with care because it adds 10 to your score When all the dragons are vaporised they will be replaced ready for the next player.

Program notes

Line(s)	
30 to 100	Set variables
120	Print dragons
150	Goto subroutine to increase *x* and *y* according to inkey$
150 to 240	Check if something is hit and if so make a random bounce
250 to 300	Keyboard scan routine
310 to 470	Print score card
480 to 510	Subroutine to alter values of *x* and *y*
520 to 570	Print display



```
10 ' DRAGONS' LAIR BY I.D.MERCER
20 CLS
30 INPUT"HOW MANY PLAYERS WILL WANT TO  USE THE SAME CAVES";P
40 IFP>10 THENPRINT"10 PLAYERS AT MAXIMUM":GOTO 30
50 IF P<1 THEN30
60 INPUT"WHICH LEVEL(1-10,10 IS HARDEST)";L
70 DN=0:FN=0:L=11-L
80 SC=0
90 GOSUB520
100 X=61:Y=2
110 SET(X,Y,1)
120 PRINT@RND(29)+32,'d';:PRINT@RND(29)+225,'d";:PRINT@RND(14)+417,"d";:PRINT@RN
D(14)+432,"d";
130 D$=INKEY$:IF D$="" THEN130
140 GOTO280
150 ON D GOSUB490,480,500,510
160 RESET(X1,Y1):IFPOINT(X,Y)=0 THEN250
170 IF POINT(X,Y)=-1 THENRESET(X,Y):PLAY"T150;O1;V20;BBBBCCCC;V31;DDDDEEEE;V15;D
DCCBBAA":DN=DN+1:IFDN=4 THEN310
180 X=X1:Y=Y1
190 PLAY'T255;V10;O2GA"
200 DC=RND(4):IFDC=D THEN200
210 D=DC
220 OND GOSUB 490,480,510,500
230 SC=SC+1
240 GOTO160
250 SET(X,Y,1):D$=INKEY$:FORZ=1TOL:NEXTZ:IFD$="" THEN150
260 IF(D$='D') AND (Y<26) THENRESET(X,Y+1):SC=SC+10
270 SC=SC+1
280 D=(ASC(D$)AND 3)+1
290 IFD$="" THEND=4
300 GOTO150
310 S(PN)=SC:SC=0
320 DN=0
330 RESET(X,Y)
340 PN=PN+1
350 F$=INKEY$:IFF$  "" THEN350
360 IFPN  P THEN100
370 CLS
380 HS=S(0)
390 FORI=0TOP-1
400 IF HS>=S(1) THENHS=S(1)
410 PRINT'PLAYER ';I+1;" SCORED ';S(1)
420 NEXTI
430 FORZ=1TO1000:F$=INKEY$:IFF$<>"" THEN430
440 PRINT:PRINT:PRINT"HIT ANY KEY FOR A NEW GAME'
450 IFP=1 THEN 470
460 PRINT@384,"WINNER SCORED":HS
470 F$=INKEY$:IFF$="" THEN470 ELSE20
480 X1=X:Y1=Y:X=X+1:RETURN
490 X1=X:Y1=Y:X=X-1:RETURN
500 X1=X:Y1=Y:Y=Y+1:RETURN
510 X1=X:Y1=Y:Y=Y-1:RETURN
520 CLS0
530 FORX=0TO63
540 SET(X,0,1):SET(X,28,1)
550 NEXTX
560 FORY=0TO27
570 SET(0,Y,1):SET(63,Y,1)
580 NEXTY
590 FORA=4TO24STEP4
600 R=RND(63):IFR<2 OR R>61  THEN600
610 FORB=1TO63
620 IFRND(L*10)=L ANDB>1 ANDB<62 THENSET(B,A+3,1)
630 IFRND(L*10)=L ANDB>1 ANDB<62 THENSET(B,A+1,1)
640 SET(B,A,1)
650 IFB=R THENRESET(B-1,A):RESET(B,A)
660 NEXTB,A
670 RETURN
```

Gradgrind grows from Greenock

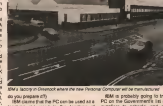
***Boris Allan** reviews the new European version of IBM's Personal Computer.*

IBM has been very successful with its PC in the USA, partly because of the IBM user and dealer support. Unfortunately if you buy a special import IBM PC from an unrecognised dealer, there will be no IBM approved service back-up or advice.

The minimum configuration for the IBM PC in Britain is superior to the USA minimum, and so importers may not be even selling an equal configuration. The only way to get IBM Warranty is to purchase from an IBM Authorised Dealer, who will provide service and warranty back-up.

The machine I reviewed was provided by an IBM Authorised Dealer, the Byte Shop Ltd of Manchester (061-236 4737). The configuration was 40K Rom, 128K Ram, two 320K discs, keyboard, monochrome display, printer adapter, and printer, and is about £3,400. The absolute minimum system consists of 40K Rom, 64K Ram, a 160K disc, keyboard, monochrome display, and printer adapter, at about £2000.

The PC is being promoted as a friendly machine, and from the promotional literature is not aimed solely at the business or larger user. The leaflet aimed at those in research and education quotes Pasteur ("In the field of observation, chance favours the prepared mind" — though how do you prepare it?)



IBM's factory in Greenock where the new Personal Computer will be manufactured

IBM claims that the PC can be used as a teaching aid, used in the teaching of computer science (with the wide variety of compilers available), used as a research tool, and as a word processor to maintain course notes. For the student, IBM claims that the PC has several advantages: it can provide a foundation for computer awareness, as a general learning tool, and for developing proficiency in languages such as Basic or Pascal.

IBM is probably going to try to get the PC on the Government's list of approved suppliers to schools, and as a British manufacturer — it will be making PCs in Greenock in all probability for the whole of Europe — it might be seen as the equivalent of the Research Machines offerings.

The new Personal Computer's keyboard

The equivalence of the RML 380Z/480Z and the IBM PC is more than at first would appear, because both these machines offer CP/M (a standard operating system) and thus have many off-the-peg programs available.

But the PC offers CP/M86 as well as ordinary CP/M, plus another operating system specially developed for the PC called MSDOS (from Microsoft).

I approached the PC, therefore, as one who was not a businessman, was not a games-player (though there are games available, including at least two versions of Adventure), but as one who was going to use the PC in what is grandly termed education.

The Byte Shop recommended one book I did not have time to read, but glancing through, it seemed to be helpful — *IBM's Personal Computer* from QUE ON SYSTEMS (1982). The manuals I used were the *Basic Manual* (Microsoft January



Boris Allan

Technical Specifications

Microprocessor	Intel 8088 (16 bit internally, 8 bit data bus) at 5MHz)
Memory	Minimum configuration is 40K Rom, 64K Ram, expandable to 0.5 megabyte
Operating System	CP/M 86 and IBM PC DOS (ie MSDOS)
Disc Storage	Minimum is 160K (single drive, single sided) expandable to 640K (twin drive double sided)
Keyboard	Qwerty standard, with numeric pad, 10 user function keys and special function keys. Provides upper and lower case, and special characters
VDU	Green screen monitor, 25 lines at 80 characters. A special colour monitor is needed for graphics
Printer	Dot matrix, 80cps, bidirectional, with four sizes of print
Connections	Keyboard, audio cassette, five expansion slots for additional memory modules, displays, printers, disk drives and communications, games adapters
Sound	Built-in speaker, user programmable
Price	Basic system around £2000

1983) and an operating system manual Though there are many other languages available on the PC I concentrated on Basic because in education, Basic is rightly the most important language

I switched on and the system booted I was left at the *executive* level I then studied the Basic manual to find how to enter Basic It was at this stage that I found I had three levels of Basic from which to choose Basic Disc Basic and Advanced Basic — in ascending order of facilities — and decided to load Advanced Basic

I loaded from the instructions given with no problems and entered my first line My first line did not work, because (and I could not find where in the manual it said so) keywords in the Basic had to be separated by spaces from other parts of the statement (something Sinclairs do automatically, and which most computers do not mind)

Once I had realised the error of my lines, there was no further problem apart from my fingers inability to obey the spaces my mind was sending (I have the same problem on the Atom)

Advanced Basic is advanced, though not so advanced as BBC Basic It has a good selection of numerical accuracies, easily used (Integer single precision, double precision, and constants) the logical connectives are the basic six connectives far more than are normally provided (Not And Or Xor Imp and Eqv) and there are many graphics commands with differing resolutions (medium at 320x200 and high at 640x200)

When we consider graphics we can compare this to the RML machines with their excellent graphics facilities and now *Gino* Graphics Ultimately the IBM will be able (once the software has been written) to reach even higher levels of resolution far higher than that of the RML machines

I think this is so because the PC can easily have more than 512K Ram without special commands being invented To have a high resolution picture on the screen requires each dot on the screen to be stored in memory somewhere, the larger the dots (ie the lower the resolution) the less the memory that is required to store information on the screen The IBM with its 16 bit Intel 8088 chip, can point to *(address)* far more memory than the RML, with its 8 bit Z80 chip The RML machines can always be tricked into pointing to more memory but the whole process slows the machine down

The IBM's 8088 chip is not, in my opinion, a particularly good 16 bit chip but it does make the ability to use large amounts of Ram so much easier than 8 bit chips The IBM is generally speaking not much faster than good 8 bit microcomputers but memory space is becoming more important

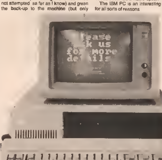
To use compilers (as against interpreters) space in memory is needed, if programs of a decent size are to be run In conventional microcomputers (with a maximum of 64K) if one had 40K of Rom for the system (as does the IBM PC) then there would only be a maximum of 24K Ram available, unless the system is tweaked to make it appear as if more memory were available

Monochrome display unit and printer

I found the whole environment of the PC easy to use the keyboard was as one would aspect from IBM, as were the rest of the attachments given that IBM seems to be committed to selling the IBM to education markets (something the Sirius I has not attempted so far as I know) and given the back-up to the machine (but only through authorised dealers) then I can see the IBM being a strong competitor to the RML machines

It is going to be interesting to see if some of the other 16 bit microcomputers (especially those using the Motorola 68000 series of chips) move into education, because it is where we should be moving It is also going to be interesting to see if the BBC Tube connection to the Nat Semi 16032 becomes a viable option

The IBM PC is an interesting machine for all sorts of reasons ■



Monochrome display main processor unit and keyboard

OPEN FORUM

Open Forum is for you to publish your programs and ideas. Take care that the listings you send in are all bug-free. Your documentation should start with a general description of the program and what it does and then give some detail of how the program is constructed. We will pay the _Program of the Week_ double our new fee of £6 for each program published.

Outlander

on Spectrum

This game could be described as a combination of Moonlander and a type of Space-invaders. The game relies mostly on the speed of the player before his fuel runs out and his ship drops out of the sky. There is a second sheet which is progressed to after the first has been cleared.

If the game is found to be too easy (or too difficult) the fuel could be altered as required. Sometimes on the first go, the ship blows itself up. Just run it again and it will continue to work.

Program notes

Lines			
210	to	270	Set up the first sheet.
400	to	700	Are the main loop
410	to	430	Detect whether the ship has hit anything by using the ATTR command
550	to	570	Detect what the bomb has hit.
600	and	610	Move the ship
1000	to	1150	Are the crash routines for the ship
2000	to	2100	Are the routines for the bomb's collisions
2500	to	2620	Include the landing and score lines which decide whether to go to another sheet or stop the game
3000	to	3030	Are the lines for the end of the game
5000	to	5700	Set up the screen for the second sheet also include the instructions
6000	to	6500	Are the instructions for whole game
8000	to	8250	Are the loops to define the characters.

```
1 REM ************************
2 REM @ Laurence Herniman
3 REM        9 1 83
4 REM ************************
50 LET hscore=0
100 PAPER 0: BORDER 0: CLS
110 PRINT AT 7,10; INK 7;"OUTLANDER"
120 GO SUB 7000
130 PAUSE 100
140 PRINT AT 10,0; INK 7;"DO YOU WANT INSTRUCTIONS? (Y/N)": INPUT a$: IF a$="y" OR a$="Y" THEN GO TO 6000
150 BORDER 7: PAPER 7: CLS : INK 0
155 LET score=0: LET sheet=1
160 LET f=0
165 PRINT AT 0,0;"SCORE ";score,AT 0,15;"HIGH SCORE ";hscore
170 IF score>=1200 THEN LET houses=11: LET fuel=500: GO TO 300
180 LET houses=7: LET fuel=300
195 LET sheet=1
200 INK 4
210 PLOT 0,70: DRAW 0,-7: DRAW 20,-10,2*PI/5: DRAW 6,0,2*PI/3: DRAW 13,0: DRAW 0,4: DRAW 5,0
220 DRAW 10,-0,-PI/2: DRAW 10,-15: DRAW 0,-3: DRAW 2,-10
230 DRAW 40,3,2*PI/3: DRAW -10,5,-PI/2: DRAW -5,5: DRAW 10,0: DRAW 4,0: DRAW 10,5: DRAW 7,14,PI/3
240 DRAW 9,0: DRAW 10,0,-2*PI/3: DRAW 10,-5: DRAW 10,-4: DRAW 7,7,PI/2: DRAW 0,-1
250 DRAW 0,-4: DRAW 9,0: DRAW 5,1: DRAW 10,7: DRAW 10,4: DRAW 1,4: DRAW 9,0: DRAW 7,7
260 PRINT AT 13,5; INK 2;"B",AT 15,13;"B",AT 15,14;"B",AT 10,10;"B",AT 14,00;"B",AT 13,1;"B",AT 12,50;"B"
270 PRINT AT 19,12; INK 1; OVER 1;CHR$ 147
280 INK 0
290 LET x=1: LET y=0
300 LET x=x+1: IF y=12 THEN PRINT AT 19,12; INK 2;CHR$ 147: IF x=20 THEN GO TO 630
400 REM
401 REM ************************
402 REM      MAIN LOOP
403 REM ************************
410 IF ATTR (x,y)=60 THEN GO TO 1000
420 IF ATTR (x,y)=65 THEN GO TO 1100
430 IF ATTR (x,y)=57 THEN GO TO 2000
440 PRINT AT x,y;"A"
450 BEEP 0.005,5
460 PRINT AT x,y;" "
470 IF fuel<=0 THEN BEEP 0.005,[illegible]: GO TO 300
480 LET fuel=fuel-1
490 LET fuel=fuel-1: PRINT AT 21,0;"FUEL ";fuel;" ": IF fuel<=50 THEN PRINT AT 21,0; FLASH 1;"FUEL SUPPLY LIMITED"
500 IF f=0 THEN LET g=x: LET h=y
510 IF INKEY$="0" THEN LET f=1
520 IF f=1 THEN PRINT AT g,h;" ": LET g=g+1
530 IF g=20 THEN PRINT AT g,h;" ": LET f=0
550 IF ATTR (g,h)=57 THEN GO TO 2200
560 IF ATTR (g,h)=60 THEN GO SUB 2000: PRINT AT 0,0;"SCORE ";score
570 IF ATTR (g,h)=60 THEN GO SUB 2100: PRINT AT 0,0;"SCORE ";score
580 IF f=1 THEN PRINT AT g,h;"C"
600 LET y=y-(INKEY$="5" AND y>0)+(INKEY$="8" AND y<31)
610 LET x=x-(INKEY$="7" AND x>1)+(INKEY$="6")
620 IF y=31 THEN LET y=0: LET x=x+1: BEEP 0.05,0.02
630 IF x=20 THEN PRINT AT x,y;" ": GO TO 3000
650 GO TO 400
700 REM
701 REM   END OF MAIN LOOP
702 REM
1000 REM ************************
1001 REM  SHIP COLLISIONS
1003 REM ************************
1010 FOR c=1 TO 80
1020 PLOT INK 2;(y*8+4),((21-x)*8)
1030 BEEP 0.005,0.5: DRAW ((RND*80)-y),(RND*80)-x
1040 NEXT c
1050 GO TO 3000
1100 PRINT AT x,y; FLASH 1;CHR$ 140
1110 FOR b=1000 TO 10 STEP -10
1120 BEEP 0.005,b/50
1130 NEXT b
1140 PRINT AT x,y; FLASH 0;" ": PAUSE 100
1150 GO TO 3000
2000 REM ************************
2001 REM    BOMB COLLISIONS
2003 REM ************************
2010 PRINT AT g,h;"C": FOR b=1 TO 30: BEEP 0.005,0: NEXT b: PRINT AT g,h;" ": LET score=score-50
2020 LET f=0
2030 RETURN
2100 LET f=0: LET score=score+50: PRINT AT g,h;"C": FOR b=1 TO 30: BEEP 0.005,4: NEXT b: PRINT AT g,h;" ": LET houses=houses-1
2150 RETURN
2200 PRINT AT 19,0; FLASH 1;"ABS DETRO 0D",AT 20,3;"SELF-DESTRUCTION NECESSARY"
2210 PRINT AT 21,0; FLASH 0
2220 FOR n=1 TO 15
2230 BEEP 0.25,0.5
2240 PRINT AT x,y; FLASH 1;"C"
2250 NEXT n
2270 PRINT AT 19,0

2500 FOR t=0 TO 100: NEXT t
2505 PRINT AT x,y;" "
2508 GO TO 3000
2500 PRINT AT 7,10; INVERSE 1;"L A N D E D"
2510 LET score=score+(100*sheet)+(fuel+10)
2520 IF sheet=1 THEN PRINT AT 19,12;CHR$ 144
2530 IF sheet>1 THEN PRINT AT 19,15;CHR$ 144
2540 FOR b=50 TO 5000 STEP 50
2550 BEEP 0.01,b/100
2560 NEXT b
2570 PRINT AT 0,0;"SCORE ";score
2590 IF houses<0 AND score>=1200 THEN GO TO 5000
2600 IF houses=0 AND score>=1200 THEN GO TO 5000
2620 GO TO 3000
3000 FOR l=0 TO 100: NEXT l: PRINT AT 0,10; FLASH 1;"GAME OVER",AT 7,4; FLASH 0;"PRESS ANY KEY TO START",AT 8,2;"PRESS I FOR INSTRUCTIONS"
3005 IF score>hscore THEN LET hscore=score
3010 IF INKEY$="" THEN GO TO 3010
3020 IF INKEY$="i" THEN GO TO 6000
3030 GO TO 100
5000 REM ************************
5002 REM    SECOND SHEET
5003 REM ************************
5010 FOR l=0 TO 300: NEXT l
5020 BORDER 6: PAPER 6: CLS
5030 LET sheet=sheet+1
5050 IF sheet>3 THEN GO TO 5300
5100 PRINT AT 0,10;"WELL DONE"
5200 PRINT "YOU HAVE BEEN AWARDED THE H.M.C. THE MEDAL FOR MERITABLE CONDUCT FOR THE DESTRUCTION OF ALL ENEMY HOUSES AND THE CONSERVATION OF SCARCE FUEL. ANOTHER MISSION HAS BEEN PLANNED"
5220 PRINT AT 0,0;"********************************",AT 21,0;"********************************"
5300 PRINT AT 20,4;"PRESS ANY KEY TO START"
5310 IF INKEY$="" THEN GO TO 5310
5320 PAPER 7: BORDER 7: CLS
5330 INK 4
5400 PLOT 0,80: DRAW 5,-9: DRAW 3,0: DRAW 0,10
5410 DRAW 2,5: DRAW 2,10: DRAW 6,4: DRAW 15,-24: DRAW -5,-10
5420 DRAW -5,-30,PI/4: DRAW -4,-20: DRAW 0,-5: DRAW 10,0
5430 DRAW 10,12: DRAW 0,10: DRAW -0,0: DRAW 0,5: DRAW 5,4: DRAW 1,-4
5440 DRAW 2,-11: DRAW 5,0: DRAW -6,6,-PI/2: DRAW 0,-11,PI/2
5450 DRAW 0,0: DRAW 0,30: DRAW 10,15: DRAW -10,10,2*PI/3: DRAW -10,15: DRAW 10,0
5460 DRAW 10,30: DRAW 5,-10: DRAW 1,-13: DRAW 10,0
5470 DRAW 15,-10: DRAW -5,-30: DRAW 4,-10: DRAW 11,0
5480 DRAW -5,-4: DRAW 2,-20: DRAW 11,0
5490 DRAW 10,9: DRAW -2,80,PI/5: DRAW -0,11: DRAW 15,0
5500 DRAW 2,2: DRAW 15,80: DRAW 2,-20: DRAW 10,0
5510 DRAW 0,15: DRAW 0,15: DRAW 3,5: DRAW 3,-5: DRAW -5,-20
5520 DRAW 1,-21: DRAW 17,0: DRAW 0,0: DRAW 0,0
5530 DRAW 7,0
5540 INK 2
5550 PRINT AT 12,1;CHR$ 145,AT 1?,0;CHR$ 145,AT 14,10;CHR$ 145
5560 PRINT AT 15,11;CHR$ 145,AT 16,15;CHR$ 145,AT 15,18;CHR$ 145
5570 PRINT AT 11,21;CHR$ 145,AT 10,25;CHR$ 145,AT 10,20;CHR$ 145,AT 11,30;CHR$ 145
5580 PRINT AT 12,29;CHR$ 145
5610 PRINT AT 18,18; INK 1;CHR$ 147
5700 GO TO 160
6000 REM ************************
6005 REM    INSTRUCTIONS
6007 REM ************************
6080 BORDER 7: PAPER 7: CLS
6100 PRINT AT 0,9; INVERSE 1;"OUTLANDER"
6150 PRINT AT 2,0;"USING THE KEYS-"
6200 PRINT AT 3,3;"5","LEFT",AT 4,3;"8","RIGHT",AT 6,3;"7","UP",AT 6,3;"6","DOWN",AT 7,3;"0","FIRE"
6250 PRINT AT 9,0;"Move your ship (A) and try to destroy the enemy buildings (B) with your unlimited bomb supply. Try not to damage the land as land is scarce and this results in a loss of points.Landing (D) earns you more points and the larger the fuel supply the more points that are added on. Over 1200 lands you onto the second sheet.Destroy all the buildings before you land"
6400 PRINT AT 21,4;"PRESS ANY KEY TO START"
6450 IF INKEY$="" THEN GO TO 6450
6500 GO TO 160
8000 REM ************************
8001 REM        U.D.G.
8002 REM ************************
8005 FOR d=1 TO 5: READ d$
8010 FOR n=0 TO 7
8020 READ a: POKE USR d$+n,a
8030 NEXT n
8040 NEXT d
8100 RETURN
8110 DATA "a",60,126,102,126,195,24,60,126
8150 DATA "b",24,60,126,255,129,129,126,126
8200 DATA "c",168,82,0,3,84,144,36,66
8250 DATA "d",255,159,185,183,159,155,159,159
8260 DATA "j",0,0,0,0,0,0,0,0
8994 REM
8996 REM
```

SCORE 1350   HIGH SCORE 0

Outlander
by Laurence Herniman

Boe-constructor

on BBC Micro

This is a deceptively simple game for the BBC Micro model A or B. The object of the game is to drive your snake around the screen eating Xs which add to your score and your snake's length. As you travel around after the Xs you must avoid the blocks which will appear, the sides and your own tail.

The program is quite well structured, having a main loop (lines 220-290) calling all the necessary procedures. As it stands the program will run on a model B. For use on a model A make the following changes:

Line 80 32200 to 15426
Line 610 31788 to 15486
Line 630 31788 to 15604

The procedures are:

PROCINST prints instructions
PROCSCR sets array values and prints screen boundaries
PROCEX prints Xs and obstacles
PROCMOOV resets array values, takes inkey and clears input buffer
PROCDRA prints snake's head
PROCUNDRA rubs out snake's last segment.

```
10 MODE 7
20 PROCINST
30 CLS
40 DIM A%(100,1):ST%=5:SA%=1:SU%=0:SCO%=0
50 GOTO 190
60 DEF PROCSCR
70FOR B%=0 TO 5
80LET A%(B%,1)=32200
90NEXT B%
100 FOR D%=0 TO 39
110 PRINTTAB(D%,1)CHR$(255)
120 PRINTTAB(D%,23)CHR$(255)
130 NEXT D%
140 FOR LA%=0 TO 22
150 PRINTTAB(0,LA%)CHR$(255)
160 PRINTTAB(39,LA%)CHR$(255)
170 NEXT LA%
180 ENDPROC
190 PROCSCR
200 PROCEX
210 PROCMOOV
220 REPEAT
230PROCDRA
240PROCUNDRA
250PROCMOOV
260 TN%=(SCL%/(ST%*3))
270 SOUND 1,-15,(50/(ST%)),1
280 FOR TL%=1 TO TN%:NEXT
290 UNTIL ? A%(0,1)<>32 OR ST%>=50
300 IF ST%>=50 THEN PROCSCREEN:GOTO 220
310 IF ? A%(0,1)=88 THEN PROCEX:GOTO 220
320 PRINTTAB(10,10)"CRASH"
330 SCO%=SCO%+ST%
340 PRINTTAB(10,12)"YOU HAVE SCORED ";SCO%
350 INPUTTAB(10,13)"ANOTHER GAME",ANS$
360 IF ANS$="Y"THEN RUN
370 IF ANS$="N"THEN MODE 7:END
380 GOTO 350
390 END
400DEF PROCDRA
410 ? A%(0,1)=79
420 ENDPROC
430DEF PROCMOOV
440FOR B%=ST% TO 1 STEP-1
450LET A%(B%,1)=A%(B%-1,1)
460NEXT B%
470L$=INKEY$(1)
480 IF L$="Z"THEN SA%=-1:SU%=0
490 IF L$="X"THEN SA%=+1:SU%=0
500 IF L$="+"THEN SU%=+40:SA%=0
510 IF L$="@"THEN SU%=-40:SA%=0
520 *FX 11,0
530LET A%(0,1)=A%(0,1)+SA%
540LET A%(0,1)=A%(0,1)+SU%
550ENDPROC
560DEF PROCUNDRA
570 ? A%(ST%,1)=32
580ENDPROC
590 K%=A%(1,1)
600DEF PROCEX
610 LET ACC%=RND(880)+31788
620 IF ?ACC%=32 THEN ?ACC%=88 ELSE 610
625 FOR L%=1 TO OB%
630  LET UCC%=RND(880)+31788
640 IF ?UCC%=32 THEN ?UCC%=255 ELSE 630
645 NEXT
650 ST%=ST%+2
660PRINTTAB(10,23)"SCORE:";SCO%+ST%
670ENDPROC
680 DEF PROCSCREEN
690 SCO%=SCO%+ST%+100
700 ST%=3
710 CLS
720 PROCSCR
730 PROCEX
740 TIME=0:REPEAT:UNTIL TIME=300
750 ENDPROC
760 DEF PROCINST
770 PRINTTAB(10,2)CHR$(132);CHR$(141)"BOA-
    CONSTRUCTOR"
780 PRINTTAB(10,3)CHR$(132);CHR$(141)"BOA-
    CONSTRUCTOR"
790 PRINTTAB(10,5)"YOU MUST DRIVE YOUR
    SNAKE"
800 PRINTTAB(10,6)"AROUND THE SCREEN"
810 PRINTTAB(10,7)"YOUR CONTROLS ARE"
820 PRINTTAB(10,9)"Z-LEFT"
830 PRINTTAB(10,10)"X-RIGHT"
840 PRINTTAB(10,11)"+-DOWN"
850 PRINTTAB(10,12)"@-UP"
860 PRINTTAB(10,13)"YOU MUST EAT THE X'S"
870 PRINTTAB(10,14)"AND AVOID THE ";CHR$
    (255);"'S"
880 PRINTTAB(5,15)"YOU SCORE 2 POINTS FOR
    EACH X EATEN"
890 PRINTTAB(5,16)"AND A 100 POINT BONUS
    PER SCREEN"
900 INPUTTAB(10,23)"SKILL LEVEL 1 OR 2",
    SCL%:IF SCL%<1 OR SCL%>2 THEN 900
910 IF SCL%=1 THEN SCL%=10000:OB%=1 ELSE
    SCL%=100:OB%=2
920 PRINTTAB(10,24)CHR$(136)"HIT A KEY
    TO START":NN=GET
930 ENDPROC
```

Boa-constructor
by Daniel Webb

Reverse

on Dragon

Reverse

The game of Reverse is very competitive but easy to master. The idea of it is to trap the opponent's pieces between two of your own and thus gain pieces.

To make a move, enter the row then column and then enter. The program gives a running display of your and the computer's score. The computer takes a few seconds to decide its move. This program can be converted for other micros.

Program notes

10 to 80 Set up the board in array A and place the first four pieces in the middle of the board
90 to 350 Work out the best move for the computer
360 to 370 Enter players moves and check them
380 to 850 Print board and scores
860 to 830 Check for pieces trapped by last move.
930 to 950 Print winner of game

To page 15

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```
1 REM REVERSE FOR DRAGON 32
2 REM BY M.HOMEWOOD (C) '82

10 CLS: PRINT @ 11, "REVERSE"
20 DIM A (10,10): FORB=1 TO 10:FORC=1TO 10
30 SOUND C+B,1
40 IF B<>1 AND C<>1 AND B<>10 AND C<>10 THEN
   A(B,C) = ASC (".")
50 NEXT C,B:H=0:N=0
60 A(5,5)=ASC ("X"):A(6,6)=ASC("X"): A(6,5)
   =ASC("O"):A(5,6)= ASC ("O")
70 INPUT "DO YOU WANT TO GO FIRST"; G0
80 CLS: GOSUB 360
90 PRINT @ 11, "REVERSE"
100 IF ASC (G0)<>ASC ("N") THEN 300
110 PRINT @ 338, "MY MOVE"
120 S=ASC ("O"): I = ASC("X"): H=0
130 FOR A = 2 TO 9: FOR B=2 TO 9
140 IF A(A,B)<>ASC (" ") THEN 300
150 U=0: FOR C=-1TO1: FOR D=-1TO1:
    K=0:F=A:G=B
160 IF A(F+C,G+D)<>S THEN 160
170 K=K+1:F=F+C:G=G+D: GOTO 150
160 IF A(F+C,G+D)<>I THEN 200
190 Q=Q+K
200 NEXT D,C
210 IF F=2 OR F=9 OR G=3 OR G=9 THEN Q=Q*2
220 IF F=3OR F=8 OR G=3 OR G=8 THEN Q = Q/2
230 IF (F=2 OR F=9) AND (G=3 OR G=8) OR (F=3
    OR F=8) AND (G=9 OR G=9)
THEN Q = Q/2
240 IF Q<H OR H=0 OR (RND(10))>3 AND Q=H)
250 M=Q: M=I: B=G
260 NEXT H,A
270 IF H=0 AND H=0 THEN 830
280 IF H=0 THEN 300
290 GOSUB 540: GOSUB 360
300 PRINT @536, "YOUR GO"
310 PRINT @ 384
320 S=ASC ("X"): I= ASC ("O") : INPUTR
330 IF R=0 THEN 380
340 IF R<11 OR R>88 THEN 320
350 M=INT(R/10) +1:N=R-10 * INT (R/10)+1
360 GOSUB 540
370 GOSUB 360: GOTO 110
380 PRINT @32: SOUND 4, RND (6)
390 C=0:H=0
400 PRINT " 12345678 "
410 FOR B=2 TO 9, PRINT B-1;
420 FOR D=2 TO 9
430 IF A(B,D)=ASC("X") THEN PRINT "X";
440 IF A(B,D)=ASC ("O") THEN PRINT "O";
450 IF A(B,D)=ASC (".") THEN PRINT ".";
460 IF A(B,D)=ASC ("X") THEN C=C+1
470 IF A(B,D)=ASC ("O") THEN H=H+1
480 NEXT D
490 PRINT; B-1
500 NEXT B
510 PRINT " 12345678"
520 PRINT: PRINT:PRINT "I HAVE ";C; "   YOU
    HAVE ";H
530 RETURN
540 FOR C=-1TO1
550 FOR D=-1 TO 1
560 F=M:G=N
570 IF A (F+C,G+D)<>S THEN 580
580 F=F+C:G=G+D: GOTO 570
590 IF A(F+C,G+D)<>I THEN 610
600 A(F,G)=I: IF M=F AND N=G THEN 620
610 F=F-C:G=G-D: GOTO 600
620 NEXT D,C: RETURN
630 GOSUB 380
640 IF C>H THEN PRINT"I WON, ";C;"-";H
650 IF H>C THEN PRINT "YOU WON,";H;"-";C
```

Reverse
by Michael Homewood

Horizontal Graphs

on Vic 20

This program requires a Vic printer. It asks you how many items of data you want to input and then the title of the graph, then you type in the data with separate titles for each column. When you have finished it prints out a graph on the printer.

Program notes

Lines	
21 to 70	Input all the data
100 to 150	Work out the scale
200 to 260	Print out the graph

```
4 REM ####################
5 REM # ALAN BLACKHAM'S #
6 REM #HORIZONTAL GRAPHS#
7 REM #   (01/10/82)    #
8 REM ####################
10 POKE36879,8
20 REM ##INPUT NUMBER OF ITEMS OF DATA##
21 PRINT"HOW MANY ITEMS OF DATA"
22 INPUT N$
24 N=VAL(N$)
25 IFN<1ORN>50THENPRINT"INVALID INPUT!":GOTO 20
26 IFINT(N)<>NTHENPRINT"WHOLE NUMBERS PLEASE.":
   GOTO 20
27 DIM N(N),T$(N)
28 PRINT"THE TITLE OF THE GRAPH"
29 INPUT G$
30 REM ## INPUT DATA ##
40 FORI=1TO N
45 PRINT"TITLE FOR COLUMN ";I
46 INPUT T$(I)
47 IFLEN(T$(I))>10THEN PRINT"PLEASE USE LESS
   THAN 11 CHARICTARS.":GOTO 45
50 PRINT"ENTER ITEM ";I
52 INPUT N$
55 N(I)=VAL(N$)
60 IFN(I)<0THEN PRINT"INVALID INPUT":GOTO 50
70 NEXT I
100 REM ## WORK OUT THE SCALE ##
110 FORI=1TO N
120 IF N(I)> N1 THEN N1=N(I)
130 NEXT I
150 SC=N1/55
200 REM # DRAW THE GRAPH #
202 OPEN1,4:CMD1:REM PRINTER
215 T=LEN(G$)/2
216 PRINTTAB(40-T),G$
217 PRINTTAB(40-T);
218 FOR II=1TOT*2
219 PRINT"-";:NEXT:PRINT
220 FORI=1TO N
225 PRINT T$(I),TAB(11),
230 FOR II=1TO N(I)/SC
240 PRINT"O";:NEXT II:PRINT" ";N(I)
250 NEXT I
255 REM # SWITCH OF PRINTER #
260 PRINT#1:CLOSE1

READY.
```

Horizontal Graphs
by Alan Blackham

Flashy Cls

on ZX81

This machine code routine provides a very fast and spectacular *Cls* for the 16K ZX81. It occupies 24 bytes and is stored in a Rem statement at line 1. After the loader program has been entered run it and enter the hexadecimal codes: then delete lines 10 to 60.

The routine is called by using *Print at usr* 16514,0: the reason for this is because after the machine code has been run the

Sinclair ZX Spectr

16K or 48K RAM... full-size moving-key keyboard... colour and sound... high-resolution graphics...



From only £125!

First, there was the world-beating Sinclair ZX80. The first personal computer for under £100.

Then, the ZX81. With up to 16K RAM available, and the ZX Printer. Giving more power and more flexibility. Together, they've sold over 500 000 so far, to make Sinclair world leaders in personal computing. And the ZX81 remains the ideal low-cost introduction to computing.

Now there's the ZX Spectrum! With up to 48K of RAM. A full-size moving-key keyboard. Vivid colour and sound. High-resolution graphics. And a low price that's unrivalled.

Professional power–personal computer price!

The ZX Spectrum incorporates all the proven features of the ZX81. But its new 16K BASIC ROM dramatically increases your computing power.

You have access to a range of 8 colours for foreground, background and border, together with a sound generator and high-resolution graphics.

You have the facility to support separate data files.

You have a choice of storage capacities (governed by the amount of RAM). 16K of RAM (which you can uprate later to 48K of RAM) or a massive 48K of RAM.

Yet the price of the Spectrum 16K is an amazing £125! Even the popular 48K version costs only £175!

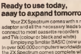
You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.

Ready to use today, easy to expand tomorrow

Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500 000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

There's no need to stop there. The ZX Printer – available now – is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232 / network interface board.



Key features of the Sinclair ZX Spectrum

- Full colour – 8 colours each for foreground, background and border, plus flashing and brightness-intensity control
- Sound – BEEP command with variable pitch and duration
- Massive RAM – 16K or 48K
- Full-size moving-key keyboard – all keys at normal typewriter pitch, with repeat facility on each key
- High-resolution – 256 dots horizontally x 192 vertically, each individually addressable for true high resolution graphics
- ASCII character set – with upper- and lower-case characters
- Teletext-compatible – user software can generate 40 characters per line or other settings
- High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY & MERGE for programs and separate data files
- Sinclair 16K extended BASIC – incorporating unique 'one touch' keyword entry, syntax check, and report codes



rum

ZX Spectrum software on cassettes – available now

The Spectrum software library is growing every day Subjects include games education and business/household management Flight Simulation Chess Planetoids History Inventions VU CALC VU-30 Club Record Controller there is something for everyone And they all make full use of the Spectrum s colour sound and graphics capabilities You ll receive a detailed catalogue with your Spectrum

ZX Expansion Module

This module incorporates the three functions of Microdrive controller, local area network and RS232 interface Connect it to your Spectrum and you can control up to eight Microdrives communicate with other computers and drive a wide range of printers

The potential is enormous and the module will be available in the early part of 1983 for around £30

sinclair

Sinclair Research Ltd, Stanhope Road, Camberley, Surrey GU15 3PS.
Tel: Camberley (0276) 685311.

Tha ZX Printer – available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set – including lower case characters and high-resolution graphics

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch

The ZX Printer connects to the rear of your ZX Spectrum A roll of paper (65ft long and 4in wide) is supplied along with full instructions Further supplies of paper are available in packs of five rolls

Tha ZX Microdrive – coming soon

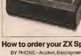
The new Microdrives designed especially for the ZX Spectrum, are set to change the face of personal computing by providing mass on-line storage

Each Microdrive can hold up to 100K bytes using a single interchangeable storage medium

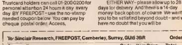
The transfer rate is 16K bytes per second with an average access time of 3 5 seconds And you ll be able to connect up to 8 Microdrives to your Spectrum via the ZX Expansion Module

A remarkable breakthrough at a remarkable price The Microdrives will be available in the early part of 1983 for around £50









How to order your ZX Spectrum

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day every day BY FREEPOST – use the no-stamp needed coupon below You can pay by cheque postal order Access, Barclaycard or Trustcard

EITHER WAY – please allow up to 28 days for delivery And there s a 14-day money back option of course We want you to be satisfied beyond doubt – and we have no doubt that you will be

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR — **Order**

Qty	Item	Code	Item Price £	Total £
	Sinclair ZX Spectrum – 16K RAM version	100	125 00	
	Sinclair ZX Spectrum – 48K RAM version	101	175 00	
	Sinclair ZX Printer	27	59 95	
	Printer paper (pack of 5 rolls)	16	11 95	
	Postage and packing orders under £100	28	2 95	
	orders over £100	29	4 95	
			Total £	

Please tick if you require a VAT receipt ☐

*I enclose a cheque/postal order payable to Sinclair Research Ltd for £ ____

*Please charge to my Access/Barclaycard/Trustcard account no

*Please delete/complete as applicable

Signature

PLEASE PRINT

Name Mr/Mrs/Miss

Address

POC 902

FREEPOST – no stamp needed Prices apply to UK only. Export prices on application.

Print position will still be the same as before so this resets it back to 0,0

The program uses 24 lines but you can make it less by *Poking* 16522 with the number of lines you wish to clear. One disadvantage of this program is that it won't work after *Scroll* has been used.

If you want to clear the screen of characters that have been *Scrolled*, you should use *Print at usr* 2602, *usr* 16514. This calls the *Cls* subroutine in the Rom and is faster and more economical than the Basic command *Cls*

```
 1 REM 24 zeros
10 LET A$=
20 FOR X=16514 TO 16537
30 IF A$="" THEN INPUT A$
40 POKE X,16*CODE A$+CODE A$(2)-476
50 LET A$=A$(3 TO )
60 NEXT X
```

Hex code	Mnemonic
3E 00	LD A,0
16 3F	LD D 63d
2A 0C 40	LD HL,(16396)
06 18	LD B 24d
15	DEC D
0E 20	LD C 32d
23	INC HL
72	LD (HL),D
0D	DEC C
20 FB	JR NZ-5
23	INC HL
10 F6	DJNZ-10
0A	CP D
20 ED	JR NZ-19
C9	RET

Flashy Cls
by Mike Dipol

Alien Attack

on Vic-20

Yes, here is another space type game. The game, designed to run on a Vic plus 3K, is based on the time-honoured practice of alien destruction. This game has, however, the dubious honour of being easy to start with and absurdly difficult at the end.

The scenario is quite simple. You pilot a small craft which moves from side to side along the top of the screen. The "—" key changes its direction of travel. Alien ships appear at various times at the bottom of the screen and creep upwards. If they get you in range they will destroy you, so you must bomb them before they reach you. The space bar drops the bombs. If you hit the centre of the alien, it is completely destroyed.

If you hit either side of the alien, one of two things can happen. First, the wing of the alien is destroyed, leaving a bent but still lethal foe. Or, the bomb will hit the alien's force field and explode. This will leave debris which will explode any bomb that hits it.

The more aliens you destroy, the faster they come. In order to maximise the speed of the game, no sound is used. My best score is 41 aliens, how about you?

```
1 POKE51,255:POKE52,19:POKE55,255:POKE5
  6,19:CLR
2 DATA0,0,0,0,0,0,0,0
3 DATA24,24,24,24,24,60,60,60
4 DATA0,0,0,16,16,16,16,16
5 DATA9,11,15,15,31,63,0,0
6 DATA144,208,240,240,248,252,0,0
7 DATA126,255,255,255,255,153,24,0
8 DATA0,0,0,0,24,24,24,24
9 DATA24,24,24,24,24,24,60,60
10 DATA24,25,31,31,31,24,24,24
11 DATA126,255,255,255,255,60,24,24
12 DATA24,152,248,248,248,24,24,24
13 DATA0,0,24,126,255,255,66,0
14 DATA0,24,24,24,24,24,0,0
15 DATA0,12,28,60,56,48,0,0
16 DATA1,144,4,80,2,88,0,33
17 DATA0,0,76,16,72,48,180,64
18 DATA128,2,64,0,0,64,4,0
19 DATA200,123,0,0,0,2,97,0
20 DATA24,24,24,24,24,24,24,24
21 DATA0,0,0,0,0,0,0,0
22 DATA0,0,0,0,24,24,24,24
23 FORI=0TO512
24 POKE5120+I,PEEK(32768+I):NEXTI
25 FORI=0TO167
26 READX:POKE5632+I,X:NEXTI
27 POKE36869,253:POKE36879,110
28 DATA0,0,0,24,24,24,24
29 S$="—♠|████|—~"
30 PRINT"□":M$="      ALIEN ATTACK":P$="
   ████████":GOSUB89
31 M$="  WRITTEN FOR VIC-20":P$="
   █████████":GOSUB89
32 M$="      BY A.E.WEBB":P$="
   ██████████████":GOSUB89
33 M$="     INSTRUCTIONS?":P$="██████████
   ██████":GOSUB89
34 GETA$:IFA$=""THEN34
35 IFA$="Y"THEN94
36 TI$="000000"
37 DD=1:SS=7680:DF=30720:SC=0
38 SP=SS:PRINT"□"
39 POKESP,32
40 SP=SP+DD
41 IFSP=7680THENDD=1
42 IFSP=7701THENDD=-1
43 DE=300-SC*5:IFDE<0THENDE=0
44 IFTI>DEANDPL=0THEN59
45 POKESP,75:POKESP+DF,1
46 FORXX=SP+22TOSP+220STEP22
47 IFPEEK(XX)=65ORPEEK(XX)=71THEN71
48 NEXT
49 GETA$
50 IFA$="←"ANDSP<>7680ANDSP<>7701THENDD
   =-DD:GOTO39
51 IFA$=" "ANDFL=0THENFL=1:QS=SP:BP=QS+22
52 IFFL=0THEN39
53 POKEBP,32
54 BP=BP+22
55 IFPEEK(BP)<>32THEN62
56 POKEBP,76:POKEBP+DF,1
57 IFBP<(QS+462)THEN39
58 POKEBP,32:FL=0:GOTO82
59 S$="—♠|████|—~"
60 IFRND(1)<.3THENS$="||—████|\"
61 POKEBP,32:PRINT"██████████████████
   ████"TAB(RND(1)*20)S$:TI$="000000":GOTO4
62 IFPEEK(BP)<>65ANDPEEK(BP)<>71THEN67
63 POKEBP,78:POKEBP-1,79:POKEBP+1,80:
   POKEBP+21,81:POKEBP+22,82:POKEB+23,78
64 FORLL=1TO20:NEXT
65 POKEBP,32:POKEBP-1,32:POKEBP+1,32:
   POKEBP+21,32:POKEBP+22,32:POKEBP+23,32
66 FL=0:SC=SC+1:GOTO82
67 IFPEEK(BP)<>66ANDPEEK(BP)<>70ANDPEEK(BP)
   <>64ANDPEEK(BP)<>84THEN78
68 IFRND(1)<.5THENPOKEBP-22,78:FL=0:
   GOTO82
69 POKEBP,78:POKEBP+22,79:FL=0:GOTO82
70 POKEBP,32:FORII=1TO20:NEXT:POKEBP,
   RND(1)*4+78:FORII=1TO50:NEXT:FL=0:GOTO82
71 FORPP=XXTOSP+22STEP-22
72 POKEPP,82:POKEPP+DF,1:NEXT
73 POKESP,81
74 FORPP=XX-22TOSP+22STEP-22
75 POKEPP,32:NEXT
76 PRINT"████YOU DESTROYED";SC
77 POKE198,0
78 PRINT"██PRESS SPACE FOR MORE"
79 GETA$:IFA$=""THEN79
80 IFA$=" "THENPOKE198,0:FL=0:GOTO36
81 END
82 DE=300-SC*5:IFDE<0THENDE=1
83 FORI=1TOINT(TI/DE)
84 S$="—♠|████|—~"
```

```
85 IFRND(1)<.3THENS$= ||-▓▓▓▓||
86 PRINT"▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓"TAB
   (RND(1)*20 S$
87 NEXT:TI$="000000"
88 GOTO39
89 O$="":FORD=1TOLEN(M$)
90 O$=RIGHT$(M$,D)+S$
91 PRINTP$;O$:FORDE=1TO50:NEXT
92 O$=RIGHT$(M$,D)+"   ▓▓▓▓   "
93 PRINTP$;O$:FORDE=1TO50:NEXT:NEXT:
   RETURN
94 PRINT"▓YOU PILOT A SPACE-SHIP.....↓"
95 PRINT"▓IT MOVES CONSTANTLY   ACROSS
   THE TOP OF THE  SCREEN."
96 PRINT"▓THE '←' KEY CHANGES   THE
   DIRECTION OF THE  SHIP."
97 PRINT"▓ALIENS...→| & —|—"
98 PRINT"          —~—    |,\"
99 PRINT"▓MOVE UP THE SCREEN.   PRESS
   THE SPACE BAR TOBOMB THEM."
100 PRINT"▓▓PRESS SPACE FOR MORE"
101 GETI$:IFI$=""THEN101
102 PRINT"▓WHEN THEY GET NEAR THETOP
   THEY WILL SHOOT ATYOU IF THEY GET THE
   CHANCE."
103 PRINT"▓THEY NEVER MISS...."
104 PRINT"▓A HIT ON THE CENTRE   OF THE
   ALIEN DESTROYS IT..."
105 PRINT"▓A HIT TO EITHER SIDE  OF AN
   ALIEN MIGHT GET THROUGH THE
   PROTECTIVESHIELDS"
106 PRINT"▓AND HIT THE ALIEN BUT THE
   ALIEN WILL STILL  BE LETHAL"
107 PRINT"▓▓PRESS SPACE FOR MORE"
108 GETI$:IFI$=""THEN108
109 PRINT"▓A BOMB HITING THE     SHIELDS
   WILL EXPLODE  LEAVING DEBRIS WHICH
   WILL";
110 PRINT" DETONATE BOMBS   FALLING ON
   THE SAME   PATH."
111 PRINT"▓▓PRESS SPACE TO START"
112 GETI$:IFI$=""THEN112
113 GOTO36
```

Alien Attack
by Alan Webb

Ruler

on Spectrum

In this program for the 16K ZX Spectrum, you attempt to rule a small country. Each year you will be asked to make several decisions which will influence your country's economy. The idea of the game is to build up as large a fortune as possible while remaining popular. After nine years in office (if you get there) there will be an election. You may stand in it if your score permits it. There are full instructions in the program.

The game includes no graphics and can, if played skilfully, go on a long time.

Decisions to be made each year

The amount of land to buy and to sell,
of corn to buy, sell and sow (the corn not used is fed to the people)

The number of people to work in the fields
to work on the dyke (this determines the amount of corn destroyed by floods)
to guard the fields (preventing thefts) and
to recruit in the army

All the figures concerning the division of the population are put back to zero each year. The taxes which may in later stages of the game exceed ten but are, at the beginning, low to avoid revolutions. You have to decide whether to invade or whether to leave the country (if you do you will be given your score).

Two things that are not included in the instructions are: if your popularity falls below 30 percent, there is a risk of having a revolution and if the density is higher than 300 people per acre your harvest will be reduced. (You start with a population of 7,500 living on 200 acres — that is, a density of 37.)

Most of the things in this game depend entirely on your decisions but a few have an element of luck. These include the harvest, the war results and the election results.

```
Ruler
[illegible]
```

Ruler
by Christian Livingstone & Piers Ludlow

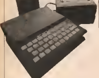
Ticket machine

***Nick Godwin** presents a program for issuing computerised tickets*

One practical use to which the ZX81 with printer attached can be put may be of interest to organisers of local events. This is the computerised ticket machine.

The program listed here is for a very simple general purpose ticket, and illustrates the principle. More complex and versatile programs can fairly easily be adapted from it to suit individual needs (for example, the inclusion of a half-price facility for children, etc).

The first part of the program sets up the ticket. Enter the number of lines of text required in the main body of the ticket. Each line is centred when the ticket is printed, so all it needs is for each line of text to be entered, one by one.



Next, the computer asks for *DATE?* which should be entered as you want it displayed. Alternatively, if the date is not applicable to the particular event, enter *newline*. The same applies to *TIME?*

Finally, enter the price, in pounds. If the amount is less than one, then the ticket will display the price in pence (eg, for the "Community Promotions" example, I entered 1.25, and for the "Borders Computer Group" I entered 0.25: both events are entirely imaginary, by the way).

After this the computer displays the cue "OK?", and you should check the display on the screen to make sure all is as you want it to appear on the tickets. If not, press "N" and *Run* again, otherwise any other key is interpreted as Yes. From then on every key depression will *Lprint* a ticket. The tickets are numbered (if you want to start at 100, change line 410).

Stop the program by pressing *Break*. *Print T* will then display the total value of tickets sold, so you can check the till. *Print N* displays the last ticket number.

```
    EYEMOUTH COMMUNITY PROMOTIONS
              PRESENTS
       "NO HASSLES IN HURKUR"
              A FARCE
        BY NICHOLAS NOBODY
      AT THE COMMUNITY CENTRE
              *  *  *
SUNDAY 5TH DECEMBER       7.30 PM
3                          £ 1.25
---------------------------------
    EYEMOUTH COMMUNITY PROMOTIONS
              PRESENTS
       "NO HASSLES IN HURKUR"
              A FARCE
        BY NICHOLAS NOBODY
      AT THE COMMUNITY CENTRE
              *  *  *
SUNDAY 5TH DECEMBER       7.30 PM
4                          £ 1.25
---------------------------------
           COMPUTER FAIR
      25TH TO 27TH NOVEMBER
          TOWN HALL, DUNS
              *  *  *
1                        25 PENCE
---------------------------------
           COMPUTER FAIR
      25TH TO 27TH NOVEMBER
          TOWN HALL, DUNS
              *  *  *
2                        25 PENCE
---------------------------------
           COMPUTER FAIR
      25TH TO 27TH NOVEMBER
          TOWN HALL, DUNS
              *  *  *
3                        25 PENCE
---------------------------------
```

```
110 PRINT "TICKET MACHINE",AT 0
,0,"TITLE - HOW MANY LINES?"
120 INPUT L
130 DIM A$(L,32)
140 CLS
150 FOR J=1 TO L
160 PRINT AT 21,0;"LINE ";J
170 INPUT X$
180 LET X=INT ((32-LEN X$))/2+1
190 LET A$(J,X TO )=X$
200 PRINT AT 2*J-2,0;A$(J)
210 NEXT J
220 PRINT AT 21,0,"DATE? "
230 DIM D$(32)
240 INPUT D$
250 PRINT AT 2*J,0,D$
260 PRINT AT 21,0,"TIME?"
270 INPUT X$
280 LET D$(32-LEN X$ TO )=X$
290 PRINT AT 2*J,0,D$
300 PRINT AT 21,0,"PRICE?"
310 INPUT P
320 LET P$=("£ " AND P>=1)+STR$
P
330 IF LEN P$>2 THEN IF P$(LEN
P$-1)="." THEN LET P$=P$+"0"
340 IF P$(1)="0" THEN LET P$=P$
(2 TO )
350 IF P$(1)="." THEN LET P$=P$
(2 TO )
360 LET P$=P$+(" PENCE" AND P<1
)
370 PRINT AT 2*J+2,31-LEN P$,P$
380 PRINT AT 21,0,"OK?    "
390 PAUSE 4E4
391 POKE 16437,255
400 IF INKEY$="N" THEN RUN
410 LET N=0
420 LET T=0
430 PRINT AT 21,0,"READY"
440 PAUSE 4E4
441 POKE 16437,255
445 CLS
450 FOR J=1 TO L
460 PRINT A$(J)
470 PRINT
480 NEXT J
500 PRINT TAB 14,"*  *  *"
510 PRINT AT 18,0,D$
520 PRINT
530 LET N=N+1
540 LET T=T+P
550 PRINT N,TAB 31-LEN P$,P$
560 COPY
570 LPRINT ,,"--------------------
-------------",,,,,,,,
580 GOTO 445
```

Shall I buy or rent it?

***Den Mitchell** presents a financial decision-maker for the BBC model A or B*

This program for the BBC Model A or B, helps you to make decisions like ' should I buy a £400 video to save the rental charges of £180 a year? '

The first information required by the program is *Initial Investment* ie the cost of the item being bought. Then you have to input the amount of time in years you think the product will last — for a video 2/3 years is enough, for other investments 5/7 years is a reasonable life expectancy.

Next, you must input the savings that accrue from the initial investment, ie buying a £400 video will save you £180 a year rental charges for the three-year life of the machine.

Finally, you should input what accountants term the "interest rate". This is based largely on the rate of inflation and takes account of the devaluation of your money, in real terms, over the years. A figure of around 8-10 percent would be reasonably accurate at the moment.

The program will now run, producing three columns of data. Column one shows the savings for each year, while column two balances the cumulative savings against the initial investment — when the sign in this column changes from negative to positive your investment has "broken-even".

The third column needs a full explanation. Basically money saved in future years is not worth as much as money now — inflation takes its toll! The program calculates or "discounts", future savings, giving its value in today's money.

The total discounted cash savings are then subtracted from the initial investment. The remaining sum is called the "Nett present value" of the investment at the interest rate originally chosen. A positive NPV means a good investment, a negative NPV should be avoided.

A further figure of particular interest to economists is the interest rate at which the investment gives a NPV = 0, this is the investment's "internal rate of return" — a measure of how good an investment is — and can be used to compare a number of roughly similar projects.

The program was written avoiding commands special to the BBC microcomputer and should thus be easily transferrable to other machines. A limited amount of error-trapping has been incorporated, but this could be extended if desired.

This is the first in a series of BBC/Education articles designed for use by schools, teachers, students and small businesses. Each week we shall concentrate on a different aspect of education-business. If you have any programs suitable for this series please send them to BBC Education, *Popular Computing Weekly*, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

Program notes

Lines 70-220 accept the input data and perform a minimum level of validity checks.

Lines 270-380 calculate the *Nett Present Value* of the investment for the period stated and at the interest (discount) rate selected at the input stage.

Line 410 prints the project's *INTERNAL RATE OF RETURN* but only when a repeated recalculation of the NPV gives a figure within £1 of zero.

Lines 420 and 430 and lines 470 and 480 set the interest rate on the first NPV recalculation to an artificially high/low value.

Line 440 or 450 calculates a new interest rate on the second and all subsequent NPV recalculations.

Lines 490-510 store in a temporary variable T the previously used interest rate, set a new rate based on the difference between the previous two rates and direct the program to recalculate the next NPV.

Lines 520-540 print the table of results to screen or printer at the interest rate initially input.

Lines 670-680 trap certain errors due to faulty data.

```
>L.
   10 REM INVESTMENT DECISION-MAKER
   20 REM c.1980 D.MITCHELL
   30 CLS MODE 7
   40 ON ERROR GOTO 570
   50 DIMR(20) DIM M(20) DIM S(20)
   60 PRINT PRINT
   70 INPUT "INITIAL INVESTMENT "P
   80 IF P<=0 THEN PRINT "  !! INCORRECT INVESTMENT !!"
 PRINT GOTO 70
   90 P=0-P
  100  INPUT "LIFE OF PROJECT IN YEARS " N
  110 IF N<1 THEN PRINT "  !! LIFE LESS THAN 1 YEAR !!"
PRINT GOTO 100
  120 IF N>20 THEN PRINT"  !! LIFE GREATER THAN 20 YRS.
 !!" PRINT GOTO 100
  130 N=INT(N)
  140 PRINT
  150 FOR I=1 TO N
  160 PRINT "INPUT YEAR ";I;" INCOME";
  170 INPUT M(I)
  180 IF M(I)<0 THEN PRINT "  !! INCOME IS NEGATIVE !!
 PRINT GOTO 180
  190 NEXT I
  200 PRINT
  210 INPUT "INPUT INTEREST RATE % ",RA
  220 IF RA<0 THEN PRINT "  !! NEGATIVE INTEREST RATE !
!" PRINT  GOTO 210
  230 CLS PRINT PRINT PRINT PRINT
  240 PRINT  INTEREST RATE IN THIS D.C.F.IS ";RA; %"
  250 PRINT
  260 C=0 X=0
  270 R=(RA+100)/100
  280 V=0 PB=P
  290 FOR I=1 TO N
  300 R(I)=R^I
  310 S(I)=M(I)/R(I)
  320 S(I)=(INT(S(I)*100+.5))/100
  330 V=V+S(I)
  340 PB=(INT((PB+M(I))*100+.5))/100
  350 IF C=0 THEN GOSUB520
  360 NEXT I
  370 PV=(INT((P+V)*100+.5))/100
  380 IF C=0 THEN PRINT PRINT  NETT PRESENT VALUE IS =
£  ;PV PRINT TAB(25);"**********"
  390 C=C+1
  400 IF C=1 PRINT:PRINT
  405 IF C<3 THEN IF ABS(PV)<=1 THEN END
  410 IF ABS(PV)<=1 THEN PRINT "INTERNAL RATE OF RETURN
 = ";(INT(RA*100+.5))/100;"%" PRINT TAB(25);"**********
" END
  420 IF PV >1 AND  C<2 THEN GOTO 470
  430 IF PV <-1 AND C<2 THEN GOTO 480
  440 IF PV>1 THEN R1=R1+ABS((R1-T)/2)
  450 IF PV<-1 THEN R1=R1-ABS((R1-T)/2)
  460 GOTO 490
  470 R1=RA*100:GOTO 490
  480 R1=RA/10 GOTO 490
  490 T=RA RA=R1
  500 IF RA<=0 THEN PRINT "NO POSITIVE RATE OF RETURN"
PRINT TAB(25); "**********"-END
  510 GOTO 270
  520 IF X=0 THEN PRINT PRINT TAB(2); "SAVINGS(£)";TAB(
14);"NET SAV(£) ;TAB(27); D,C F (£)"
  530 IF X=0 THEN PRINT TAB(4);"------------------------
-------"
  540 PRINT M(I),PB;TAB(27);S(I)
  550 X=X+1
  560 RETURN
  570 CLS PRINT PRINT
  580 PRINT"**************************************"
  590 PRINT **************************************"
  600 PRINT PRINT
  610 PRINT"    DATA BEING ENTERED IS FAULTY"
  620 PRINT PRINT TAB(12);"IN SOME WAY"
  630 PRINT PRINT
  640 PRINT **************************************"
  650 PRINT **************************************
  660 PRINT PRINT PRINT TAB(7);"PLEASE RE-RUN PROGRAM"

  670 END
>*KEY0 SAVE"DCF"|M|M
>
```

Whirligigs and whorls

***John Dunford** presents three simple routines to mimic the effects of a spirograph*

Most people will be familiar with the famous Spirograph and the patterns that can be formed with it The program follows exactly the same principle

Program one produces a simple example of how the Spirograph technique is used You can experiment by changing the number in line 30 Each number will result in a slightly different pattern

Program two, and its variants, go one step further to produce a more complicated pattern By changing line 10 in program two to give different boundaries and steps other interesting patterns can be formed Try this for example

```
10 FOR n=1 TO 8 STEP .2
```

Now type in.

```
10 FOR n=1 TO -9 STEP -.2
20 LET a=n PI
80 READ Z INK Z
170 NEXT n
180 DATA 5 3 4 2 1
```

The program has been laid out so that the individual drawing steps can be clearly identified

For something completely different type in program three and run. Now change line 80 to read

```
80 FOR n=167 TO 0 STEP -16
```

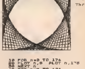
■



The ZX Spectrum being used at Sutton Primary School Cambridgeshire

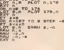
Program Two

This is the basic program



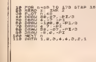
Program One

```
30 LET a=-.500*PI
40 PLOT 120,140
50 DRAW -32,-120,a
60 DRAW 88,88,a
70 DRAW 120,-32,a
80 DRAW 120,-32,a
90 DRAW -88,88,a
100 DRAW 32,-120,a
110 DRAW 32,120,a
120 DRAW -88,-88,a
130 DRAW 120,32,a
140 DRAW -120,32,a
150 DRAW 88,-88,a
160 DRAW -32,120,a
```

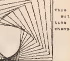


```
10 FOR n=0 TO 174
20 PLOT n,0  PLOT n,175
30 NEXT n
40 FOR n=0 TO 174
50 PLOT 0,n  PLOT 175,n
60 NEXT n
70 LET a=0
80 FOR n=167 TO 0 STEP -8
90 LET a=a+5
100 PLOT 0,n  DRAW a,-n
110 DRAW n,a
120 DRAW -a,n
130 DRAW -n,-a
140 NEXT n
```

...and this is the more complicated pattern.



```
10 FOR n=55 TO 175 STEP 15
20 READ Z  INK Z
30 PLOT n,40
40 DRAW 50,87,-PI/3
50 DRAW 4,-7,-PI
60 DRAW -100,0,-PI/3
70 DRAW 4,7,-PI
80 DRAW 50,-87,-PI/3
90 DRAW -8,0,-PI
100 NEXT n
110 DATA 1,2,3,4,4,3,2,1
```



Dictionary

MODULE 3 *Lines 2000-2210*
The purpose of this module is to display the dictionary of characters page by page and to move a cursor around the page allowing the user to specify characters for a number of simple operations.

Commentary
2060 The fairly involved figures which are to be included in the string to be *Drawn* simply specify that each character to be drawn will be placed 32 pixels to the right of the last or at the start of the screen and 45 pixels down if the end of a line has been reached This allows for the full 32•32 grid on which the character was designed plus room for a moving cursor
2080 While the variable S records the absolute position of the character currently pointed to within the dictionary, S1 is used to indicate the position of the cursor on the screen
2100-2130 A flashing cursor routine which uses the value of the loop variable I to set the colour with which the cursor is *Drawn* and thus needs only the one line to *Draw* and re*Drew* to invisibility
2150 The cursor move line based on the left and right arrowed keys
2160 Input of "D' will result in the deletion of the character to which the cursor is pointing from the dictionary
2170 Input of 'C' adds the character to which the cursor is pointing to the current character set
2180-2190 The up and down arrows are used to move to the previous or following page of the dictionary
2200 Input of 'Q returns program execution ot the menu

Testing
Since no characters have yet been loaded from tape it is difficult to test this module but since there are almost bound to be errors in entering it we shall adopt the temporary expedient of entering some simple specimen characters with the following line
8888 LET D$ = 'BM + 1, + 0,R0 ' FOR H = 0 TO 7 LET E$ = FOR I = 0 TO 13 LET E$ = E$ + D$ LET DI$(H • 14 + I) = E$ NEXT I NEXT H LET DI = 110
This line provided that the program has been initialised can be called in direct mode or even called as a subroutine from the initialisation module and will load the dictionary with 112 characters which are actually sets of 14 lines of increasing length traversing the 32•32 pixel space diagonally from the top left corner

Having run line 8888 calling up this module should display the first page of the dictionary and allow the full range of functions specified in the commentary

MODULE 4 *Lines 2500-2590*
Having begun to build up a character set from the main dictionary this module allows the user to display the current state of the character set

Commentary
2580 Input of "D" while the character set is being displayed will result in the character set being deleted Note that this is achieved simply by setting CI to zero — there is no need to physically wipe out the character set Pressing any key other than 'D' will return to the menu

Testing
You should now be able to create a character set from the main dictionary and display that character set ■

***The Working Dragon 32**, by David Lawrence costs £5.95 and is available from **Sunshine Books Ltd**, Hobhouse Court, 19 Whitcomb Street London WC2 7HF*

Module 3

```
2000 REM*************************
2010 REM DISPLAY DICTIONARY
2020 REM*************************
2030 LET S=0
2040 PMODE 4,1 PCLS:SCREEN 1,0
2050 FOR I=S TO S+31
2060 DRAW "BM"+STR$(32*((I-S)-8*INT((I-S)/8)
))+","+STR$(45*INT((I-S)/8))+";"+DI$(I)
2070 NEXT I
2080 LET S1=S-32*INT(S/32)
2090 LET T$=INKEY$:IF T$<>"" THEN GOTO 2150
2100 FOR I=1 TO 2
2110 DRAW "C"+STR$(I)+";BM"+STR$(32*(S1-8*INT
(S1/8))+8)+","+STR$(45*INT(S1/8)+48)+",E3,F3"
2120 FOR J=1 TO 25 NEXT J
2130 NEXT I
2140 GOTO 2090
2150 LET S1=S1-(T$=CHR$(9))+(T$=CHR$(8)):LET
S1=S1-(S1<0)+(S1>31)
2160 IF T$="D" THEN FOR I=S+S1 TO DI-1 LET
DI$(I)=DI$(I+1) NEXT I LET DI=DI-1 GO TO 2040
2170 IF T$="C" THEN IF CI<=48 THEN LET CHAR$
(CI)=DI$(S+S1) LET CI=CI+1
2180 IF T$=CHR$(10) THEN LET S=S-32*(S<128)
GOTO 2040
2190 IF T$=CHR$(94) THEN LET S=S+32*(S>31)
GOTO 2040
2200 IF T$="Q" THEN RETURN
2210 GOTO 2090
```

Module 4

```
2500 REM*************************
2510 REM DISPLAY CHARACTER SET
2520 REM*************************
2530 PMODE 4,1 PCLS:SCREEN 1,0
2540 FOR I=0 TO CI
2550 DRAW "BM"+STR$(32*(I-8*INT(I/8)))+","
+STR$(32*INT(I/8))+","+CHAR$(I)
2560 NEXT I
2570 LET T$=INKEY$ IF T$="" THEN GOTO 2570
2580 IF T$="D" THEN LET CI=0
2590 RETURN
```

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ORIC 48K. Brand new £170 or swap for 16K Spectrum + £60 ono Tel 01-405 8411 (before 4 pm) extension 321 Craig Pickering.

ATARI 800, 32k Rom + sound + graphics £275 new + £130 of necessary peripherals important items. £125 of games one year old, £260 Tel Winchester 883736

MICROFAN 64K TANNEX lower case graphics Ascii keyboard 19in WAC case £150 Lichfield (05432) 52824 evenings

DRAGON 32 £4K of software £180 ono T Forrest. Tel Stafford 58107

UK 101 8K Rom Segmon printer interface £125 610 expansion board 24K Ram disc interface £125 10 amp PSU 5 volt + 12 £20 Mr Alderton Tel Sheffield 20571

TRS 80. Model I Level II + Tandy cassettes + software (lots) Newly serviced £240 Tel 01 881 2761

TRS 80, Model I Level II 16K with VOU cassette recorder software £150 Tel Braham 7968

DRAGON 32 + joysticks, nearly new £170 Tel 051 922 1745

ZX PRINTER, perfect condition guarantee + 3 extra paper rolls £55 Tel Swindon (080871) 2750

BURROUGHS 86 + separate disc drive offers to Mr Coggins Telephone Barnsley 298531

SEIKOSHA G.P.80 PRINTER, features include single double graphic printhead RS232 interface selectable baud/rate Mint condition including manuals and leads £160 Tel Wigan 832678 after 5 pm

EPSOM MX80 F T 1 PRINTER. Good condition maximum 132 cols 100 cps IEE interface to Pet + Serial RS 232 £300 ono Tel 01-748 9064 evenings

COMMODORE 80 80 DUAL DISC DRIVES holds 174K per drive Manuals and leads Many discs + programs games, WP, etc £450 (cost £890) Tel 01 748 9064 evenings

ARE YOU interested in Synthesizer and/or CB radio? For exchange for any home computer — mini Sinclair Synthesizer plus manual old only Tel 01 853 0021

MICROLINE 80 PRINTER and optional RS 232 interface + paper roll holder £170 ono Super board III with seg mod and software including Word Wizard word processor program £80 Tel 0753 654431

TUG SOFTWARE EDITOR ASSEMBLER £12 Dive Bomber £5 Tel 0252 871731 after 6 pm

COMPUKIT VIC101 8K micro computer £110 Tel 021-421 4925

GRUNDY NEWBRAIN A, unwanted gift in mint condition complete with manual beginners guide and tape near £241 will accept £210 Tel Ryton 089422 5166 C Dixon

DRAGON 32, nine months old. Swap for Spectrum or sell for £150 Tel 01-654 8027 (evenings) Tel 01-839 8818 (work) Mr Osborne

FOUR APPLE II PLUS + disc drive monitor and of software Offers Tel 01-359 2486

VIDEO GENIE, 16K, level II basic cursor control keys + integral cassette recorder + level meter + software manuals and mags, including Microsoft edit/assembler + 911 green screen monitor £250 Tel 021 745 5984

SHARP PC1211, printer and manuals £80 ono Tel 01-668 8841

Wanted

WANTED VIC 1515 PRINTER or similar Tel 0803 409966 anytime

WANTED XZ81 (prefer 16K) Good working order with instruction manual Tel 066 475-358 (Leicester)

WANTED ZX SPECTRUM 16K Will pay £150 ono Tel Frome (0373) 84197 (6 pm-8 pm)

WANTED COMMODORE PRINTER cash Tel 962 8249

WANTED ZX81, 16K RAM leads, manuals etc + software £50 Tel Coventry 0203 403788 Mr Brown after 6 pm

VIC20 COMPUTING MAGAZINES WANTED Volume 1 Tel 0902 892911

WANTED 16K Rom pack for Vic20 and price Paul Irvan Tel 01-890 8862

WANTED Sinclair ZX Printer about £30 to £40 Tel 0691 830072.

WANTED Sharp 7280K, 48K. Cash waiting. Tel Wigan (0942) 58996

TANK ATAK or Spiders of Mars cartridge for Vic20 Tel 0438 811534 after 6 pm.

48 SPECTRUM/K JOYSTICK. Less than £30 Does not need mother board. Tel 061 868 5780

POPULAR COMPUTING WEEKLY, 29 July Issue 15 wanted £1 offered. Telephone 01-607 1802

BBC MODEL B, Essex area preferred (0702) 346003

WANTED VIC Super Expander around £25 Phone 01-840 3610 (evenings)

WANTED Acorn Atom under £100 Tel 01-874 2585.

ZX81, 16K Ram with tapes etc Tel 881 968 (Wigan)

WANTED — BBC Model A. Tel St Albans 62485 after 6 pm

WANTED RAT RACE CART Offers Avenger or any others Tel Chesham 786673

WANTED Monitor to fit ZX Spectrum. Tel Durham 43362

WANTED Commodore 8000 Series micro, disc unit +printer Tel 0325 60543

WANTED Sinclair printer £35 S Bradshaw Tel Rainhill 3767

WANTED ZX81 16K Ram £48 Tel 01 764 4640 (after 5 pm)

VIC20 16K RP in exchange for 8K RP and programmers aid cartridge or machine code monitor Tel Peter on 01 442 0806

WANTED Colour monitor to fit ZX Spectrum Price negotiable Tel Durham 43362

WANTED Sinclair Printer Must be in good condition Tel Winchester 62186

WANTED APPLE II EURO PLUS, with manuals Tel 0604 720106 (after 6 pm)

WANTED. MZ80K games to swap + exchange Tel 0532 498595

WANTED ZX81 8K. Will pay £40 Tel 01 764 4640

FOR VIC 20 Super expander machine code monitor + programs aid cartridge Tel 061-546 0675 Stewart.

ZX81 REQUIRED Second hand Several wanted Tel (0283) 35170

48K SPECTRUM WANTED for exchange Acorn Atom, expanded to 12K Rom + 12K Rem and floating point expansion and power supply and all leads etc £100 programs Tel 01 789 4260

WANTED ZX81 16K + software approximately £45 or swap for reflectograph Pro real to real tape recorder (Cambridge area only) Tel Barkway 779

WANTED BBC Model B guaranteed and boxed willing to pay £240 Mr C Nwankwo 18 Derrycombe House Fifth Floor Brunel Estate London W2

WANTED 16K Sinclair Ram pack £10 Tel Calne (0249) 812038 after 5 pm (Wiltshire)

WANTED Atari 800 32K or 48K. Must be in good condition. Tel 01-571 1009 (Kilkey) after 7 pm

SUPER EXPANDER for Vic20 in exchange for the Court Cart. Tel Flint 61887 evenings



PROBLEM MAY BE IN OVERHEATING

D Holmes of Old Lane, Golcar, Huddersfield, West Yorkshire writes

Q **I have a Sinclair Spectrum and two major problems. The first is that I cannot get colour on my Hitachi television, and even when I do get it on another television, it is usually slightly blurred. Is it the television, or the PAL unit that is wrong?**

Secondly, when using my television on a black and white set, after about twenty lines the display goes from a dark grey background to a light grey background, and is sometimes hardly legible. Can you help me with these two problems please?

A There have been problems with the Spectrum colour display. Some televisions sold on the British market are slightly out of phase. This does not matter with a normal television reception but a computer is more fussy. On the first issue of Spectrum PCBs there is a small hole in the bottom that gives access to a tiny screw. Careful adjusting of this with a non metallic object should improve the situation. On the second issue, of PCBs, there is no external access, which means taking the top off your Spectrum. The screw is slightly left of centre.

In your case however, I think that the problem is something else, because of the second point you raise. This is more akin to problems that develop because of overheating. Do you find that your peogrem corrupts after your computer has been left on for a while? Either this or it simply *News* itself from time to time. If either of these things happens then you will have to return your Spectrum.

YES, AND HERE IS ITS ADDRESS

David Cox of Huntingfield, Egham, Surrey writes

Q **I have seen a company called Ground Attack, which had a Ram pack reviewed for the ZX81. I cannot find an address for Ground Attack. Can you help?**

A Yes, here it is
Ground Attack
Alfreda Avenue,
Hullbridge,
ESSEX

If you write to them I am sure they will be happy to send you details of what you want.

MEMORY IS SPLIT INTO AREAS

Paul Chisholm of West Bromwich, Birmingham writes

Q **Can you explain memory mapping to me? I have seen it mentioned several times in computer magazines, and know it is to do with what a computer stores in its address. But I do not know whether the memory map for a Vic20 with 16K is the same as say a Spectrum with 16K, or does the Spectrum have the same memory map as a 48K Spectrum?**

A A memory map is the order in which the computer stores all the things that go to make up its memory. With most home computers, including the Vic and the Spectrum, this is an area of 65,535 addresses (64K). More addresses can be added, but they could not all be used at once. The memory is divided into areas, some for use by the Rom and the rest by the Ram.

A Z80 chip, as on the Spectrum, will always take up the first 16K of space, even if it is not all used (the ZX81 uses only 8K of Rom). The Vic and similar 6502-based computers use the very top 16K of memory.

Even if a computer can potentially use 64K, only some of that may be taken up. Thus an unexpanded Spectrum will use 16K of space for Rom, and 16K of the space for Ram, and the rest is unused. All computers use some of the Ram for the screen and the systems variables. This is 1.5K on a Vic and about 7K on a Spectrum. So a 16K Spectrum will have 9K user Ram available, and a 48K, 41K user Ram.

Each area, Rom, systems variable and user Ram takes up a specific part of the memory. Things such as a calculator stack, *Gosub* stack and variables also have an allocated position. These are always stored in the same order, but the actual addresses that they occupy will change as the program gets larger. The order of these in the Spectrum is gvien on page 165. It is a ptiv that not all manuals give a memory map to help the user.

A computer will always have its own unique memory map. The main changes are usually to do with how far into the possible Ram memory the on board Ram extends.

EASY GOING FOR FASTER GAMES

Jane Spencer of Highfields, Durham, writes

Q **I have a BBC Model B and am learning quite well. However, I have tried to write some games programs but would like them to be faster. Is there a compiler available for the BBC B and if so, how much is it and where can I get it?**

A Yes, there is a compiler written by Jeremy Ruston. It comes complete with a listing as well as a cassette. It is available from Interface, 44-46 Earls Court Road, London W8 6EJ for £34.95.

NO INDEPENDENT LITERATURE

D Holyoake of Upper Elmers End Road, Beckenham, Kent, writes

Q **Could you please tell me whether there is a manual or any literature available for the Research Machines 380Z, as these are the computers used in my O-level studies course.**

A I have not been able to find any independent literature on the 380Z. Neither Foyles nor Georges had any thing that I could find. It must be pointed out that as the 380 is used solely as an education machine, so it does not have the normal back-up associated with machines commonly found in the home market sector.

The only thing you can do is get in touch with Research Machines yourself and ask them. They do a range of manuals which they can supply you with, for between £3 and £6. All you need to do is contact their sales department and tell them what you want. You will probably find them quite hard going, as they are written for teachers who already have a good knowledge of computing, and are not 'user friendly'. Research Machines is at P O Box 75, Mill Street, Oxford (phone 0865 249791).

WHETHER OR NOT TO BUY

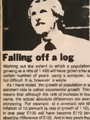
Thomas Van Dahl of Park Lane Rise, North London, writes

Q **I have a Vic20 and I am quite happy with it. I am considering buying a light pen for it, but I am not sure how it works or if one is worth buying. I have not seen many programs for them.**

A A light pen works by using a photo-resistor. This has an emitter and a collector. A window in the photo-transistor collects the light as it passes between the emitter and collector. This changes the resistance. A high value will be returned for a dark or black area, and a low value will be returned for a white or light colour. This is how a bar code is read. The duration of the value returned will, of course, give you the thickness of the line.

Whether or not you should buy one is up to you. I think that at the moment you might find it better to wait until more programs are available. On the other hand you might regard it as a challenge to write your own.

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can. The address is *Peek & Poke*, *PCW*, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.



Falling off a log

Working out the extent to which a population growing at a rate of 1 495 will have grown after a certain number of years using a computer, is not difficult. It is, however, a waste.

As I have noted, the growth of population at a constant rate is called *exponential* growth. This means that although the *rate* of increase is the same, the actual *absolute* differences are ever increasing. For example, at a constant rate of inflation of 10 percent (a rate of growth of 1 10), in one year £100 will have become £110 (an absolute difference of £10). And in two years the amount will be £121 (a further increase of £11).

The less wasteful way of dealing with such growth takes a hint from the term "exponential" and uses logarithms. Different computers use different ways of expressing logarithms: some call them Log, others Ln, and there are other variants. In instant mode (or in a program) enter

```
X=LOG(1 495) Z=19*X. T=EXP(Z) PRINT T
```

to which the output from the *Print* is 2080.57. If you check this against the result of successive multiplications of 1 495, then you will find that the two numbers are in agreement.

Try entering

```
X=LOG(5) Y=LOG(6) Z=X+Y T=EXP(Z)
```

and then investigate the values of *X*, *Y*, *Z* and *T*, by use of *Print*. *X* is 1 6094, *Y* is 1 7918, *Z* is 3 4012 and *T* is 30 0000. What we have is the multiplication of the numbers 5 and 6 by use of logarithms (*Exp* corresponds to what is called the antilogarithm in school mathematics).

If you enter *Print T*−30 (on the computer I am using) the answer is −2 5802E−8, so that *T* must actually be about 29.99999997. As my machine only prints out 9 significant digits (and the value 29.99999997 has 10 digits) it rounds to 30.

To use logarithms therefore is to incorporate some slight inaccuracy, but the advantage of the method is that it is shorter.

The slight inaccuracy in the logarithm function (and there has to be an inaccuracy in some cases) is reflected in another provided function in most versions of Basic.

The function is the "power" function usually written as ** or ↑, where, if *N* is the number and *P* is the power, *N****P* is the equivalent of N^P or *N***N** … **N* where there are *P* terms in the expansion.

If we enter

```
A=2*X. B=EXP(A) PRINT B
```

then we find that *B* is 25, that is, 5*5. In the above line *X* is the number and 2 is the power. When the Basic translator in the computer meets *N****P* it works out *EXP(P*LOG(N))* — which is why *P* may not turn out to be a whole number. (What is *N* times *N* 2 5 times?)

To investigate the degree of inaccuracy in calculating powers try something like

```
1000 FOR I=1 TO 30 PRINT I*I−I**2 NEXT I
```

and you will find that sometimes it is exact and sometimes it is not. This inexactitude comes about in two ways — the conversion to the logarithm is not exact and numbers are not usually held exactly by the computer.

You may have heard that certain microcomputers have 9 to 10 digit accuracy and that others have an accuracy of about 7 digits (most calculators seem to have 8 to 10 digits accuracy). How is it possible to work this out? If a computer stores the number part (rather than the relative size/exponent part) in 32 bits (ZX81, Pet, Apple II etc) then the largest whole number it can store is about 2^{32}. We have to find what that number is and then how many digits there are in that number.

The number is given by *EXP(32*LOG(2))*. To find how many digits that is, we calculate *32*LOG(2)/LOG(10)* which is 9 636. ■

Boris Allan

Puzzle

Pricing the blues

Puzzle No 43

Once in his early years Picasso popped down to his local art supplies emporium to replenish his stock of painting materials. He was particularly short of blue paint. Crayons were 50F, brushes were 700F and the tubes of blue paint were 300F.

He returned with 100 items, having spent 10 000F. If he bought at least one brush, crayon and tube of paint, how many of each did he buy?

Solution to Puzzle No 36

The lowest palindromic perfect square with an even number of digits is 698896 (836^2).

The program generates successive squares and the sub-routine checks to see if the square is palindromic. Lines 10, 30, 100 and 110 ensure that only squares with an even number of digits are considered.

```
10 LET L = 10
20 LET U = 10
30 FOR N = INT (SQR L) + 1 TO U − 1
40 LET S = N*N
50 LET S$ = STR$ S
60 GOSUB 200
70 IF T <> 0 THEN GOTO 90
80 PRINT N S
85 STOP
90 NEXT N
100 LET L = L*100
110 LET U = U*10
120 GOTO 30

200 Rem palindromic check
210 LET T = 0
220 FOR P = 1 TO LEN S$/2
230 IF S$(P) <> S$(LEN S$ − P + 1) THEN LET T =
    T + 1
240 NEXT P
250 RETURN
```

Winner of Puzzle No 38

The winner is P M Devereau, Worley Road, St Albans, Herts, who receives £10.

Top 10

Atari

1(3) Air Strike (English Software)
2(7) Rear Guard (Adventure International)
3(4) Astro Chase (First Star)‡
4(–) [illegible] (Atari)*
5(–) Preppie (Adventure International)
6(6) Soccer (Thorn EMI)¶
7(–) Centipede (Atari)*
8(–) Lunar Lander (Adventure International)†
9(–) Computer Chess (Atari)*
10(8) Chop Lifter (Broderbund)¶

*Cartridge. †24K cassette. ‡32K cassette. ¶48K disc.
(Figures compiled by Calisto Computers, Birmingham 021-632 6458)

ZX81

1(3) King Kong (Tony Barber)
2(2) Flight Simulation (Psion)
3(1) 3D Defender (JK Greye)
4(4) Gulp II (Campbell Systems)
5(8) Football Manager (Addictive Games)
6(6) Centipede (Llamasoft)
7(7) Gauntlet (Cultumatic)
8(8) Adventure 1 (Abersoft)
9(10) ZXAS (Bug-Byte)
10(5) Sea War (Panda)

*All 16K.
(Figures compiled by Buffer Micro Shop, London 01 769 2887)

Spectrum

1(1) The Hobbit (Melbourne House)*
2(3) Penetrator (Melbourne House)
3(4) Flight Simulation (Psion)
4(2) Time Gate (Quicksilva)*
5(6) Football Manager (Addictive Games)
6(–) VU-3D (Psion)
7(7) Arcadia (Imagine)
8(8) Hungry Horace (Psion/Melbourne House)
9(8) 3D Tanx (DK Tronics)
10(–) Centipede (DK Tronics)

*Requires 48K.
(Figures compiled by Buffer Micro Shop, London 01 769 2887)

Vic20

1(1) Andes Attack (Llamasoft)†
2(5) Gorf (Commodore)*
3(9) Myriad (Rabbit)
4(8) Martian Raider (Romik)
5(7) Grid Runner (Llamasoft)
6(3) Frog (Interceptor Software)
7(10) Moons of Jupiter (Romik)
8(6) Skramble (Rabbit)
9(2) Abductor (Llamasoft)
10(4) Alien Attack (Interceptor Software)

*Cartridge. †Requires 8K or 16K.
(Figures compiled by the Vic Centre, London 01-992 8904)

Books

1(3) Assembly Language Programming for the BBC Micro *Birnbaum* (Macmillan)
2(2) Spectrum Machine Language for the Absolute Beginner *Tang* (Melbourne House)
3(1) Creative Graphics on the BBC Microcomputer *Cownie* (Acornsoft)
4(5) Basic Programming on the BBC Micro *Cryer* (Prentice Hall)
5(4) Programming the 6502 *Zaks* (Sybex)
6(–) Understanding Your Spectrum, *Logan* (Melbourne House)
7(–) Z80 Assembly Language Programming *Leventhal* (Osborne)
8(–) Programming the 6809 *Zaks* (Sybex)
9(8) Graphs and Charts on the BBC Micro *Harding* (Acornsoft)
10(10) Forth Programming *Scanlon* (Sams)

(Figures compiled by Watford Technical Books, Watford 0923 23324)
(Last week's position in brackets)

